Moving from Landscape Connectivity Theory to Land Use Planning Practice: Ontario as a Case Study

by

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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Planning

Waterloo, Ontario, Canada, 2009

Author's declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Landscape connectivity is a concept that refers to a landscape's structural and functional continuity, allowing for the flow of water, nutrients, energy, organisms, genes, and disturbances at many spatial and temporal scales. The loss of landscape connectivity leads to ecosystem fragmentation, which in turn contributes to a decline in biodiversity and threatens many species around the world. The importance of maintaining landscape connectivity is becoming recognized as a fundamental principle in land use planning.

The purpose of this dissertation is to examine how the theory of landscape connectivity has been applied in Ontario's land use planning policy and practice between 1970 and 2008. This includes evaluating the degree to which theory has been applied to practice in landscape connectivity planning. In addition, the work investigates the processes that facilitated the movement from theory to practice in planning for landscape connectivity. Broadly framed within the theories of conservation biology, the research approach is qualitative and the research design includes a literature review, content analysis, and case study research.

This research found that there has been an evolution of theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008. The introduction of conservation biology principles created a growing public awareness, which contributed to rising pressure on the Government of Ontario to reform its land use planning policies. The theory of landscape connectivity is included in key land use planning legislation and policies and is now an accepted part of planning for natural heritage in the province. The Ontario Municipal Board has regard for landscape connectivity as a legitimate planning concern. In the majority of cases in the last decade in which landscape connectivity was identified as a deciding factor, the Ontario Municipal Board ruled in favour of protecting landscape connectivity. Planners in

Ontario are expected to plan for landscape connectivity, but Ontario's planning law and policy does not provide strong direction to planners on the issue of landscape connectivity. Recommendations for the Government of Ontario, based on the research findings, include planning for landscape connectivity at a provincial scale, creating a guidance document specifically for landscape connectivity and revising the Provincial Policy Statement.

Acknowledgments

First and foremost, I would like to thank my family and friends for their love, understanding and countless hours of babysitting. I truly could not have completed this dissertation without everyone's continued help. Thank you!

I would like to give special thanks to my advisor, Dr. Paul Eagles, for his ongoing support, advice, encouragement and patience. I would like to thank my committee members, Dr. Wayne Hawthorn, Dr. Sarah Michaels and Dr. Stephen Murphy, for their insightful questions and comments and for their willingness to share their time and expertise with me as I designed, researched and wrote my dissertation. I would also like to thank my external examiner, Dr. Graham Whitelaw, for his excellent questions and thoughtful review of my dissertation.

Thanks to Dr. Christopher Wilkinson for encouraging me to start this research and for making sure that I finished it. Thanks also to my fellow students at the School of Planning who made this long experience an enjoyable one. Finally, thanks to Edie Cardwell for all of her administrative help and kindness over the years.

Dedication

This dissertation is dedicated to my daughter, Grace. Thank you for bringing me such love, joy, and inspiration!

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List of Acronyms

AOC	Area of Concern
ANSI	Area of Natural and Scientific Interest
CPDR	Commission on Planning Development and Reform
ECO	Environmental Commissioner of Ontario
ESA	Environmentally Sensitive Area
GTA	Greater Toronto Area
L4L	Lands for Life
MMAH	Ministry of Municipal Affairs and Housing
MNR/OMNR	Ontario Ministry of Natural Resources
NHS	Natural Heritage Strategy
NHRM	Natural Heritage Reference Manual
NEP	Niagara Escarpment Plan
NEPDA	Niagara Escarpment Planning and Development Act
NOESP	North Oakville East Secondary Plan
NOMI	North Oakville Management Inc.
OBS	Ontario Biodiversity Strategy
OLL	Ontario's Living Legacy
OMB	Ontario Municipal Board
ORM	Oak Ridges Moraine
ORMCA	Oak Ridges Moraine Conservation Act
ORMCP	Oak Ridges Moraine Conservation Plan
PPS	Provincial Policy Statement
RRCA	Raisin Region Conservation Authority
SWHTG	Significant Wildlife Habitat Technical Guide

1 Introduction

Landscape connectivity is a concept that refers to a landscape's structural and functional continuity, allowing for the flow of water, nutrients, energy, organisms, genes, and disturbances at many spatial and temporal scales (Noss, 1991; Harrison and Voller, 1998: Taylor et al., 2006). Landscape connectivity is commonly defined as "the degree to which the landscape facilitates or impedes movement among resource patches" (Taylor et al., 1993, 2006; With et al., 1997). The importance of maintaining landscape connectivity is becoming recognized as a fundamental principle in land use planning (Bennett, 1999; Bennett et al., 2006; Botequilha Leitao and Ahern, 2002; Noss and Daly, 2006; Saura and Torne, 2009; Wilkinson, 2002). Connectivity is described as a concept that has captured the imagination of conservation biologists worldwide (Kareiva, 2006). Around the world, rapid development of lands and subsequent landscape transformation pose a serious threat to biological diversity (Bennett, 1999; Brown and Harris, 2005; Crooks and Sanjayan, 2006; Dale et al., 2000; Environmental Commissioner of Ontario, 2002; Farina, 1998; Jongman, 2004; Van Langevelde et al., 2002; Sinclair et al., 2005; Soulé and Terborgh, 1999). Planning for landscape connectivity, like planning for biological conservation, requires "thinking big, thinking long, and thinking across the full range of spatial and temporal scales" (Knight and Landres, 2002, p. 30). Although maintaining landscape connectivity is a complex and challenging problem for planners, elements of landscape connectivity theory appear in both policy and planning practice worldwide.

Landscape connectivity is a very important issue for planners. The loss of landscape connectivity leads to ecosystem fragmentation, which in turn contributes to a decline in biodiversity and threatens many species around the world (Bennett, 2003;

Hilty et al., 2006; Millenium Ecosystem Assessment, 2005; Noss, 1987; UNEP, 2005). Although the fragmentation of terrestrial ecosystems also occurs naturally, such as by fire, drought or geological processes, anthropogenic changes to the landscape greatly alter landscape connectivity. Agricultural development, industrial development and urbanization often reduce available habitat and fragment the remaining landscape into 'patches' (Bennett, 1999; Dobson et al., 1999; Hobbs, 2002). The process of ecosystem fragmentation has been widely tested scientifically (Boothby, 2000) and it is known to have four recognizable components: (1) an overall loss of natural habitat in the landscape; (2) a reduction in the size of the patches of natural habitat that remain; (3) an increased proportion of edge in relation to total area; and (4) increased isolation of natural habitats as new land uses occupy the intervening environment (Bennett, 1999; Hilts et al., 2006; Pullin, 2002). This combination of habitat loss, habitat reduction, and habitat isolation serves to alter ecological processes and, in turn, affects wildlife and plant communities (Crooks and Sanjayan, 2006). Fragmentation is an important problem for planning not only because it impacts species dispersal, extinction and recolonization, but also because it is typically the beginning of overall habitat loss (Boothby, 2000). Loss of biodiversity occurs “hand-in-hand” with loss of habitat and the planet loses at least 27,000 species to extinction every year (UNEP, 2005, p. 40).

There are two methods which landscape planners use to maintain, create or restore landscape connectivity in fragmented landscapes: (1) using linkages (or corridors) of habitat between fragmented patches; and (2) managing the entire landscape mosaic so as to provide better connectivity throughout the matrix (Bennett, 2003; Crooks and Sanjayan, 2006; Hilty et al., 2006). The ideal method would be to manage the entire landscape so that connectivity is maintained for species, communities and ecological processes (Bennett, 2003), but the reality faced by planners is often a landscape already fragmented and altered. The theory of landscape

connectivity is still emerging and, compounding this, linkages are species-specific, multi-scale and multi-functional, and must be planned for on a case-by-case basis (Hilty et al., 2006). Such specificity makes it difficult to build generalizations that are transferable to other cases. This poses a considerable challenge to planners who must implement policy regarding linkages. The challenge of planning for landscape connectivity may be seen as an example of a gap between theory and practice (Bennett et al., 2006; Hilty et al., 2006). This problem is not unique to landscape connectivity. How to bridge the gap between theory (knowledge development) and practice (knowledge application) is a common theme in the field of planning. Bridging the gap - or gulf, as has been said "between the academic theory and research side of our field and the urgency of effective professional practice" is raised as the most important issue for the future of planning education and, by extension, planning practice (Violich, 2001, p. 57).

However, the theory-practice gap is a matter of particular concern for land use planning because the protection of biodiversity requires immediate action and thus land managers are often forced to make decisions without full empirical support for many of the proposed theories and procedures (Bennett et al., 2006; Lambeck and Hobbs, 2002). Opdam et al. (2002) noted that most empirical process studies are of no use to landscape management if they fail to transfer the information to the level of problem solving. With (1997, p. 1440) stated, "The debate over the utility of theory in conservation research has generally failed to acknowledge that the problem lies not with theory per se, but with the application of theory and the failure to understand or address the underlying assumptions that may constrain the use of theory in practice". Given this perspective, it is useful to address a problem that examines the theory-practice gap of landscape connectivity. It is not, however, appropriate to approach the problem in simple terms of whether or not the theory of landscape connectivity is being

applied correctly because, as yet, there is no one correct and proven method of implementing the theory. Instead, it is more useful to ask *how* the theory of landscape connectivity is being applied in land use planning.

The purpose of this dissertation is to examine how the theory of landscape connectivity has been applied in Ontario's land use planning policy and practice between 1970 and 2008. This includes evaluating the degree to which theory has been applied to practice in landscape connectivity planning. In addition, the work investigates the processes that facilitated the movement from theory to practice in planning for landscape connectivity.

Ontario was chosen as the geographic focus of this dissertation because it provides an excellent context for research into planning for landscape connectivity. Human-induced ecosystem fragmentation has been an issue in Ontario for the past century and remains a serious problem for Southern Ontario (Environmental Commissioner of Ontario, 2002; Environmental Commissioner of Ontario 2000; Wilkinson, 2001). In response, there has been considerable application of landscape connectivity theory in land use planning practice, law, and regulation in Ontario over the last decade. Ontario has included concepts of landscape connectivity in provincial planning of crown land at a regional scale, legislation affecting private land at a regional scale, and policy affecting all land use planning at a municipal level.

The study of landscape connectivity is interdisciplinary, deals with spatial, biological and temporal analysis at multiple scales and factors in human influences (Ahern, 1999; Bennett, 1999). An integrated, interdisciplinary approach is required for planning problems such as landscape connectivity (Ahern, 1999; Crooks and Sanjayan, 2006; Kleyer at al., 1996; Linehan and Gross, 1998; Opdam et al., 2002). This dissertation is broadly framed within the theories of conservation biology. The research approach is qualitative and the research design includes a literature review, content

analysis, comparative analysis and case study research.

This dissertation has eight chapters. Chapter 2 presents a literature review of the theory of landscape connectivity. This chapter provides the context and background of the research problem, presents a review of landscape connectivity literature, identifies gaps in the literature, and establishes the relevance of the thesis research to landscape connectivity and, on a broader scale, the fields of planning and conservation biology. Chapter 3 details the research methodology, research design, and limitations of the research. Chapter 4 presents a history of Ontario's land use planning system, an overview of the development of natural heritage policy in Ontario, and an introductory examination of the movement of theory to practice in planning for landscape connectivity in the province. Chapter 5 presents the results of a content analysis of Ontario's land use planning law and policy. Chapter 6 examines the manner in which the landscape connectivity provisions of relevant legislation and policies were interpreted and applied by the Ontario Municipal Board. Chapter 7 examines several case studies that were selected to represent the spectrum of land use planning in Ontario with regard to landscape connectivity. Chapter 8 summarizes the research findings and presents recommendations for improving Ontario's approach to planning for landscape connectivity. The chapter concludes with a discussion of the relevance of the research findings to the field of planning and suggests future research opportunities.

2 Literature Review

2.1 Introduction

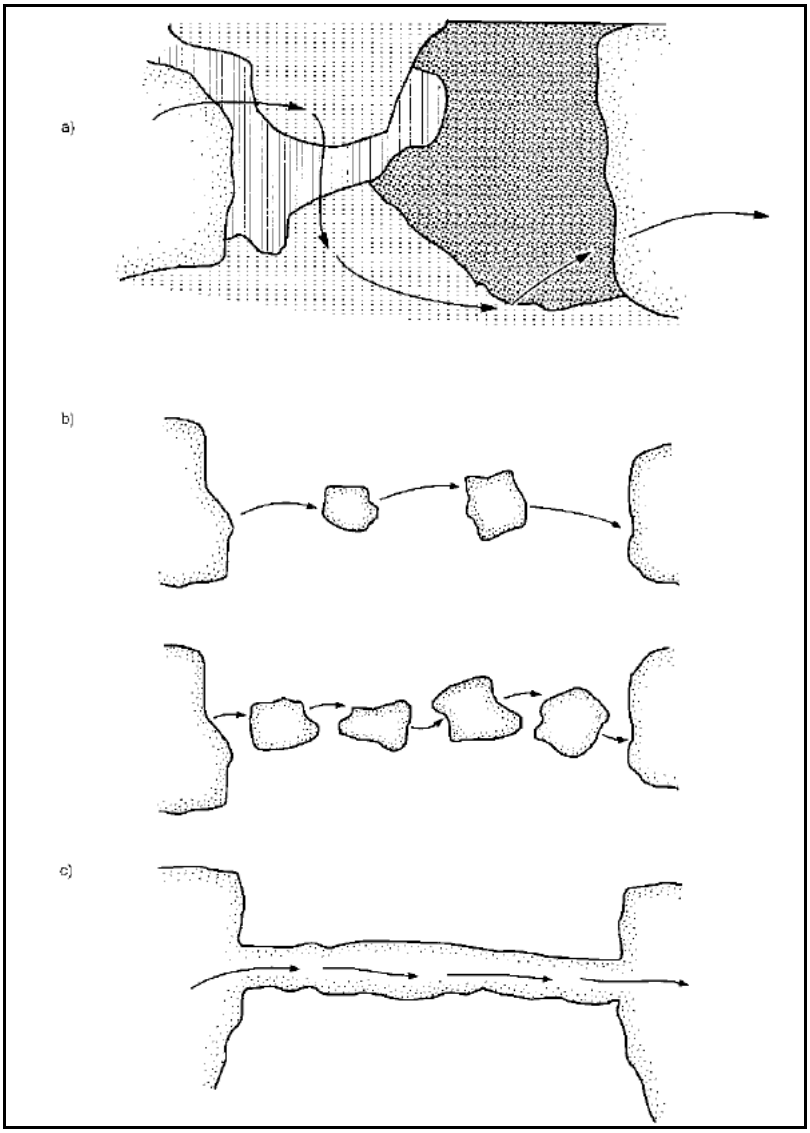
Chapter 2 explores theories and concepts important to planning for landscape connectivity. After a review of the concept of landscape connectivity and its theoretical bases (island biogeography, metapopulation theory and landscape ecology), gaps in understanding will be outlined. Next, the fields of planning and conservation biology are reviewed with an emphasis on the how the concepts of uncertainty, dynamic non-equilibrium and scale play an important role in shaping this study's approach to the problem of landscape connectivity. Landscape ecological planning, ecosystem management, as well as adaptive planning and management are then selected as planning approaches for landscape connectivity. Finally, opportunities and constraints to addressing landscape connectivity within urban and regional planning are discussed.

2.2 Landscape Connectivity

Landscape connectivity is an ecological term that describes essential connections between habitats, species, communities, and ecological processes (Noss 1991; Harrison and Voller, 1998; Taylor et al., 2006). It involves both a structural component (the total amount and spatial distribution of habitat in the landscape) and a functional component (the interaction of ecological processes with landscape pattern) (Taylor et al., 2006; With, 1999). If the structural components are arranged so that various types of habitat are linked and species and communities are able to disperse freely, the landscape has spatial connectivity. If these linkages are maintained throughout time, so too are the landscape processes, and thus the landscape also has temporal connectivity. There are two methods for maintaining connectivity in fragmented landscapes: 1) enhancing the intrinsic connectivity of the matrix by

managing the whole landscape mosaic; and 2) using linkages or corridors of habitat to connect isolated patches (Bennett, 2003; Bunnell, 1999). Figure 2.1 illustrates landscape connectivity methods (Bennett, 2003, p. 51).

Figure 2.1 Landscape Connectivity Methods



(Bennett, 2003, p.51)
a) Habitat Mosaic: Connectivity is maintained by managing the entire mosaic, which contains both undisturbed and modified habitats (such as rangeland or sustainable forestry
b) Stepping Stone Linkages: Habitat patches of various size and spacing assist species movement through hostile matrix.
c) Habitat Linkage: Linkage consists of continuous habitat.

Managing the entire landscape mosaic works best to provide connectivity when a large

part of the landscape remains in a natural or semi-natural state, when the species concerned have a high tolerance for the existing land uses, and the goal is to protect wide-ranging species that require large areas of habitat (Bennett, 2003).

2.2.1 Linkages

An ecological linkage can be defined as a "pathway, connection or relationship between natural features and areas" (OMNR, 1999, p. 49). Another useful definition of linkage is "an arrangement of habitat (not necessarily linear or continuous) that enhances the movement of animals or the continuity of ecological processes through the landscape" (Bennett, 2003, p. 10). The term `corridor' is frequently used to describe linkages. However, `corridor' has a widespread and varied usage within many different disciplines and therefore does not have one succinct definition (Dobson et al., 1999; Hess and Fischer, 2001; Lindenmayer and Fischer, 2007). Professionals from different backgrounds may use the term corridor to refer to a structural, functional, or both structural and functional element of the landscape (see Table 2.1 from Hess and Fischer, 2001, p.209). This has led to much confusion over what corridors are and what the goals of planning for corridors should be. As noted by Hanna and Webber (2005), the concepts of connectivity and linkages are often subject to disagreement among planners, politicians, environmentalists and developers, with each group applying their own interpretations based on their needs and self-interests. This dissertation will use the term linkage instead of corridor, both to avoid the definition confusion and to recognize that connectivity can be maintained without on the ground corridors *per se*.

Table 2.1 Uses of the Term 'Corridor'

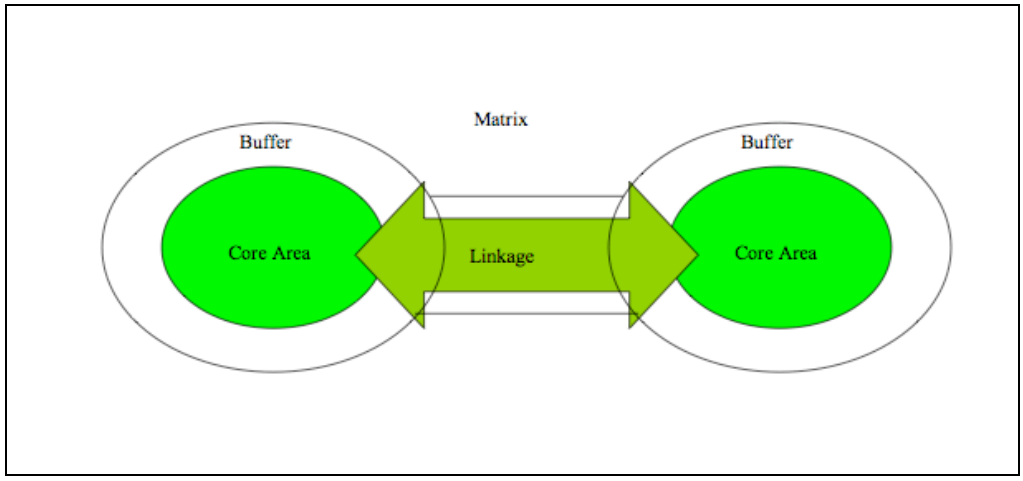
Simberloff et al. (1992) identified six usages of the term:
1. Distinct habitat, whether or not it aids movement. 2. Greenbelts and buffers in urban areas. 3. Biogeographic land bridges. 4. Series of "stepping stone" refuges for migratory waterfowl. 5. Highway underpasses and tunnels designed for wildlife passage. 6. Strips of land that facilitate movement between large habitats.
Andrews (1993) described five functions of wildlife corridors:
1. Permit colonization of new sites as they become suitable. 2. Allow wildlife to move out of sites as they become unsuitable. 3. Permit recolonization of sites locally extinct. 4. Allow species to move between separate areas as needed for different stages of their life cycle. 5. Increase overall extent of habitat, especially for species with large range requirements.
Forman (1995) identified six societal goals of corridors:
1. Biodiversity protection. 2. Enhancing water resources management and water quality protection. 3. Enhancing agro forestry production. 4. Recreation. 5. Community and cultural cohesion. 6. Dispersal routes for species isolated in nature reserves.

Linkages are species-specific, multi-scale, and multi-functional, and thus there can be no one "ideal" linkage type for a given landscape (Bennett, 2003). Linkages can function as conduit, habitat, filter, barrier, source and sink, often simultaneously, depending on the perspective of the target species. Linkages can function at many scales, from fencerows along the edge of a field, to strip corridors forming linkages at the landscape level, and to regional corridors connecting a network of reserves (Bennett, 2003; Dobson et al., 1999). The variety of linkage types currently used in landscape planning is reflective of the different levels of dispersal capacity amongst species and the different levels of connectivity that exist within landscapes. Different species have different scales of movement and a suitable linkage for one species may be unsuitable for another species, or even for an individual of the same species that is at

a different stage in its life cycle (Dobson et al., 1999). For example, a study of stepping stone linkages for resident woodland birds in urban areas found that the maximum tolerable gap between wooded patches in the breeding season was 300 meters for Long-Tailed Tits, between 200 and 250 meters for Bush Warblers but only 100 meters for Varied Tits (Hashimoto, 2007). In addition, corridors may increase predator activity by improving connectivity for foraging predators, and so improving connectivity may have positive effects for some species and negative effects for others (Weldon, 2006).

Linkages are used as part of an integrated approach to biological conservation. The ecological network concept is based on the UNESCO Man and Biosphere Program (Soulé and Terborgh, 1999) and was further developed by Noss and is important in that it uses a hierarchy of management zones to integrate protected areas within a larger area of human activity and development. A system of core areas, linkages and buffer zones serves to protect key habitat, maintain connectivity between the patches and provide a transition zone in which edge effects are minimized (see Figure 2.2).

Figure 2.2 Ecological Network Concept



(based on Soule and Terborgh, 1999)

2.2.2 Landscape Connectivity Theory

Landscape connectivity *per se* is not a new concept. Simpson (1936) used the

term `corridor' in his description of the exchange of fauna between two biogeographically distinct areas. Preston (1962) noted that the use of corridors between protected areas would be necessary to prevent isolation and loss of faunal species within individual parks. Field biologists have long been aware of the importance of using linkages to maintain landscape connectivity. Pragmatic knowledge based on the observations in Table 2.2 has served to guide many land management decisions (Bennett, 2003, pp.37-38).

Table 2.2 Pragmatic Knowledge Supporting Linkages

Observations of the migratory movements of species, in particular large mammals and waterfowl, have encouraged national and international efforts to protect migratory routes.
Observations of the impact of local barriers (e.g. roads and railway lines) on the movements and mortality of animals have stimulated research into the implementation and evaluation of artificial measures (e.g. underpasses, tunnels and bridges) designed to help wildlife cross barriers.
Knowledge of the natural history of animals that move between different habitats on a regular basis to acquire necessary resources has highlighted the need to maintain landscape linkages in areas modified by human land uses.
Observations of the ability of local populations to recolonize small habitats after being decimated by over-hunting has led game biologists to recognize the importance of travel corridors in wildlife management

(Bennett, 2003, pp. 37-38)

There have since emerged three main approaches to landscape connectivity: island biogeographic theory, metapopulation theory, and the landscape ecology approach.

Island Biogeographic Theory: MacArthur and Wilson (1967) published *The Theory of Island Biogeography* in which they used data from oceanic islands to study the mechanisms of natural population equilibrium in land masses of different sizes. They proposed that the number of species on an oceanic island represents a balance between

extinction and immigration and is a function of the island's total area and degree of isolation from the mainland. MacArthur and Wilson's theory not only explained island equilibrium, it also expanded the concepts of insularity and isolation in that it was applicable to all natural habitats and sparked many further studies on habitat islands, nature reserves, and viable populations (see Bunnell, 1999). The habitat patches created by fragmentation were seen as habitat islands, and Wilson and Willis (1975) proposed that corridors could be used to decrease the isolation of the patches and thus help prevent the loss of species diversity.

Island biogeographic theory has since decreased somewhat in popularity amongst conservation biologists because habitat patches or fragments are fundamentally different from oceanic islands in the way that they are isolated (Bennett, 1999). Habitat patches are not surrounded by an inert sea, but by a matrix that may affect dispersal and colonization rates, provide alternative habitat for the focal and generalist species, facilitate the invasion of the patch by exotic species, and determine the severity of edge effects (Davies et al., 2001). For example, overall species richness might actually increase as a patch gets smaller because new species may invade at the edges, and this is a major limitation of island biogeographic theory. The simplistic use of the concept of species richness only takes into account overall species numbers but not *which* species compose the community (Doak and Mills, 1994; Pullin, 2002).

This shortcoming may limit the potential of island biogeographic theory to contribute to current research on landscape connectivity. Island biogeographic theory, if used in simplest terms of species richness, ignores the role of ecological processes and impacts from the surrounding matrix and does not provide a sufficiently comprehensive framework for furthering knowledge about landscape connectivity. However, the theory can be used successfully if one accounts for which species are increasing or decreasing. For example, it is very important to differentiate between

native and exotic species. From a planning perspective, this theory remains useful in terms of explaining basic landscape connectivity concepts to a lay audience.

Metapopulation Theory: Levins (1970) introduced metapopulation theory. The term "metapopulation" refers to an interconnected number of populations of the same species that occupy an arrangement of habitat patches. According to metapopulation theory, populations are spatially structured into groups. In terms of MacArthur and Wilson's (1967) theory this is similar to several islands located close to each other. The local breeding subpopulations and migration among these subpopulations results in a recolonization following local extinction, thereby producing regionally stable metapopulation dynamics within a landscape of suitable and unsuitable patches of habitat (Turner et al., 2001). Unlike classical island biogeography theory, there is no mainland or source population in a metapopulation and, if a patch becomes disconnected, it will face the same increased risk of extinction as any small population (Bunnell, 1999).

Harrison (1991) introduced several different models of metapopulations that better take into account the heterogeneity of patches: source-sink populations, patchy populations, and non-equilibrium metapopulations. In source-sink populations, patches with excess levels of reproduction are considered source patches, while patches where local mortality exceeds reproductive success are considered sink patches (Turner et al., 2001). The migration of excess individuals from the source patch to the sink patch helps maintain the overall population. Patchy populations are those that do not have a source or mainland population but are instead a group of isolated sub-populations, each with a finite possibility of extinction (Bennett, 1999; Harrison, 1991). In non-equilibrium metapopulations, the normal condition is to be recovering from the last disturbance. In this model, the community structure is determined by interactions

between disturbance processes, a heterogeneous environment and the recruitment of individuals and species- equilibrium is rarely achieved (Parminter, 1998).

Metapopulation theory has largely replaced classical island biogeography as a theoretical basis for understanding population dynamics in fragmented landscapes and it serves as an important conceptual framework for landscape connectivity (Bennett, 1999). Two major criticisms of metapopulation theory, however, are its single-species approach and the fact that most of the metapopulation research has consisted of modeling rather than field studies and, unfortunately, not all metapopulation models are testable in practice (Breininger et al., 2002, Bennett, 1999; Doak and Mills, 1994; Whittaker and Fernandes-Pallacios, 2007). Also, within continental environments with species that have good migration potential, there is a continental source population that continually affects the individual patches. In terms of planning for landscape connectivity, metapopulation theory has been useful in raising awareness about extinction risks, dispersal probabilities, and the need for monitoring (Breininger, 2002; Doak and Mills, 1994). Metapopulation theory has led conservation biologists to pay greater attention to spatial structure and temporal interdependency of networks of local populations (Whittaker and Fernandes-Pallacios, 2007). Metapopulation theory can be used to support the use of stepping stone linkages (Pullin, 2002).

***Landscape Ecology*:** Landscape ecology is a discipline which studies landscape structure (pattern), function (process), and change (Hobbs, 1997). It is a branch of ecology that evolved in Europe as a holistic approach to understanding the interrelationship between humans and natural, urban and agricultural landscapes (Naveh and Lieberman, 1990). The German biogeographer Troll first used the term landscape ecology in 1939, and he hoped this new approach would encourage closer collaboration between geographers and ecologists, thus bridging the gap between the

spatial-chorological approach of the geographer, and the functional and structural approach of the ecologist (Naveh and Lieberman, 1990). As it emerged in the 1960s in Europe and the 1980s in North America, landscape ecology brought together a wide variety of disciplines, including ecology, geography, land use planning, landscape architecture, and even some historians (Ndubisi, 1997). In North America, however, the focus of landscape ecology seems to be more on natural rather than human landscapes.

Landscape ecology studies spatial patterns within landscape mosaics, how spatial patterns influence ecological processes and how landscape mosaics change over time (Bennett, 1999). The focus is on the differential responses of organisms to landscape structure, and connectivity is assessed by the extent to which movement is facilitated or impeded through different types of habitat across the landscape (With, 1999). The landscape itself is not inherently connected or fragmented, but can instead be both at once, depending on the perspective of the species being studied. Determinants of functional connectivity include: 1) landscape context; 2) distance between patches of suitable habitat; 3) presence of barriers to movement; 4) interference from humans and predators; 5) mobility or dispersal characteristics of the target species; and, 6) other individual characteristics of the target species (such as preference for particular plant species or structural features of the habitat; feeding or nesting requirements; mortality risks) (Noss and Cooperrider, 1994, p. 151). And so, in landscape ecology, connectivity is measured according to the scale at which species interact with the scale of fragmentation, and habitat does not need to be structurally connected if the organisms' gap-crossing abilities are good (With, 1999). For example, highly mobile species, like White-tailed Deer, can easily move across an open field whereas less mobile species, such as a Blue-spotted Salamander, would perceive the field to be a barrier to their movement.

The landscape ecology approach to landscape connectivity expands upon metapopulation theory in that it recognizes a greater degree of complexity in the landscape than does metapopulation theory. Instead of viewing the landscape in simple terms of matrix, patches and corridors, the landscape mosaic perspective views the landscape as complex, heterogeneous mosaics consisting of multiple types of habitat (Wiens, 1995; With, 1999). In addition to taking into account how populations interact with spatial pattern, landscape ecology considers: (1) variation in patch quality; (2) variation in the quality of the surrounding environment; (3) boundary effects; and, (4) how the landscape influences the level of connectivity among patches (Turner et al., 2001).

Landscape ecology has been criticized for lacking a strong theoretical basis. Wiens (2002, p. 15) suggests that because much of landscape ecology's theory is verbal (putting ideas in prose), rather than mathematical (scientifically precise, reductionist and real), the capacity of landscape ecology to provide a theoretical foundation for conservation action is limited. Opdam et al. (2002) note that many authors of detailed studies in landscape ecology, both empirical and theoretical, fail to attempt to bridge the gap to generalization and application. They cite a major gap in the field of landscape ecology as the lack of methods to transfer studies of single species to generalized knowledge on the relation between landscape pattern and biodiversity.

However, of these three approaches to landscape connectivity, landscape ecology is the most comprehensive. Landscape ecology recognizes the dynamic role that humans play in the landscape (Naveh and Lieberman, 1990) and views planning as a participatory process that must include the landscape's human inhabitants (Ndubisi, 1997). Landscape ecology is very useful for planning as it allows planners and ecologists to view the landscape from a shared perspective, meaning that ecological knowledge can be better interpreted to provide ecologically sound landscapes (Ndubisi,

1997). This dissertation contributes to a better understanding of landscape ecology as it focuses on bridging the gap between knowledge development and knowledge action.

2.2.3 Gaps in Understanding

The theory of landscape connectivity is widely accepted within landscape and environmental planning and the use of linkages is intuitively appealing, but gaps remain in our understanding. The efficacy of linkages at providing landscape connectivity has been questioned by some, most notably by Simberloff et al. (1992), largely due to a lack of empirical evidence. There are three main criticisms surrounding the use of linkages, or more specifically linear corridors, to maintain landscape connectivity: 1) whether there is sufficient scientific evidence to demonstrate the potential conservation value of corridors; 2) whether the potential negative effects of corridors (e.g. spread of predator/pest species, disturbances, invasive species, and increased contact between wild and domestic species) may outweigh any conservation values; and, 3) whether corridors are a cost-effective option (Bennett, 2003; Crooks and Suarez, 2006, Dobson et al., 1999). These criticisms do not attack the theory of landscape connectivity itself but rather the use of linkages or corridors, which is the most widely-used method of maintaining connectivity (for further reading on the corridor debate, see Beier and Noss, 1998; Bennett, 2003; Cushman et al., 2008; Falcey and Estades, 2007; Lindenmayer et al., 2008; Saunders and Hobbs, 1991; Simberloff et al., 1992). As noted by Harris and Scheck (1991), the critical question is not whether linkages are good or bad, but whether a managed, interconnected system of protected areas that utilizes movement corridors will function better as conservators of biodiversity than other known alternatives, such as focusing conservation efforts solely on protecting valuable habitat patches. The use of linkages should be considered an important complement to, but not a substitute for, establishing large and multiple

reserves (Noss, 1992; Noss and Daly, 2006). Carroll et al. (2003) conclude that connectivity planning must focus not on linear corridors but on ensuring functional connectivity in a broader landscape context.

The species-specific utility value of linkages and the practical difficulties of locating and establishing appropriate test sites have made it very difficult to implement the multi-scale methods necessary for quantifying linkage success (Saure and Torne, 2009; With, 1999; Vos et al., 1999). Studies have tended to be small-scale and some have ignored variables, such as the increase in habitat area created by linkages. The inherent difficulties of conducting experimental studies have led to much interest in the use of computer modelling to predict and quantify landscape connectivity (Hobbs, 1997; Hobbs, 2002; Marulli and Mallarach, 2005; Saure and Torne, 2009; With, 1999). Modelling approaches include vector-based movement models and grid-based movement models, both of which use spatial data provided by geographical information systems (Vos et al., 1999; With, 1999). Modelling approaches are considered to be especially important when: 1) the potential linkage is not fully constrained by urbanization or other irreversible barriers, 2) the linkage is designed for multiple focal species, and 3) planners need to provide a transparent, rigorous rationale for a linkage design (Beier et al, 2008). Graph-theory or network frameworks have also been proposed as new tools for measuring aspects of landscape connectivity (Bunn et al., 2000; Rae et al., 2007; Urban and Keitt, 2001; Minor and Urban, 2007; Estarada and Bodin, 2008). Graph theory merges population processes, like dispersal, with landscape-level spatial patterns of habitat patches, in order to attain measures of connectivity based on ecological processes (Urban and Keitt, 2001). Connectivity models, based on electrical circuit theory, are also proposed as useful approaches for planners and ecologists (McRae et al., 2008).

Some recently published modeling studies include: identifying important

habitat patches for Wood Thrush conservation using graph theory as a proxy for spatially explicit population models (Minor and Urban, 2007); mapping regional conservation corridors (Cushman et al., 2008); identifying habitat linkages for black bears (Kindall and van Manen, 2007); planning for climate change by identifying dispersal corridors (Williams et al., 2005); evaluating the effectiveness of a regional corridor in connecting two black bear populations (Dixon et al., 2006); assessing the importance of habitat quality and landscape connectivity for endangered Natterjack toads (Stevens and Baguette, 2008); comparing the effectiveness of corridors relative to enlargement of habitat patches (Falcy and Estades, 2007); and, investigating the role fragment shape may play in limiting population sizes in habitat fragments (Ewers and Didham, 2007).

There has been a rapid expansion of quantitative methods for measuring connectivity, but many of the connectivity indices analysed by Saura and Pascual-Hortal (2007, p.101) were found to present "serious limitations that discourage their use as a basis for planning decision making". There is still a lack of tools for assessing connectivity in real-world planning problems and, as noted by Saura and Torne (2009), more effort is required from the research community to provide end-user applications and practical recommendations for integrating connectivity considerations in landscape planning, otherwise the metrics and methodologies being developed for landscape connectivity analysis may remain theoretical developments in the academic arena, with no real impact on actual landscape planning or biodiversity conservation.

2.2.4 Empirical Evidence Supporting Linkages

Beier and Noss (1998) conducted a comprehensive review of published studies that empirically addressed the question of whether linkages increase or decrease the population viability of species residing in habitat patches connected by linkages. They

concluded that the evidence from well-designed studies support the utility of linkages as a valuable conservation tool. Bennett (1999) also conducted a thorough review of published linkage studies and he, too, concluded that high levels of habitat connectivity are associated with a greater increase in population viability in isolated habitats. Debinksi and Holt's (2000) review of habitat fragmentation experiments revealed that the most consistently-supported hypothesis was that linkages and connectivity positively affect species movement and species richness.

The results of a 2002 field research study made a very significant contribution to the evidence in favour of linkages. In the largest experimental study of the effects of linkages conducted to that date, a team of researchers demonstrated that linkages not only increase the exchange of animals between patches, but also facilitate two critical plant-animal interactions: seed dispersal and pollination (Tewksbury et al., 2002). The results of this study are important as they provide conclusive empirical evidence in support of linkages. Tewksbury et al. prove that linkages do indeed facilitate interpatch movement and serve to maintain key mutualisms between plants and animals in fragmented landscapes.

Although large carnivores are highly susceptible to the effects of habitat fragmentation and many populations of large carnivores now inhabit fragmented habitats, the effectiveness of linkages for large carnivores had not been tested on a regional scale until Dixon et al's 2006 study of two Florida black bear populations. Using non-invasive hair snares and population-assignment tests, Dixon et al. concluded that a regional corridor between Ocala National Forest and Osceola National Forest is functional and provides genetic and demographic connectivity between the Ocala and Osceola bear populations.

There is still, however, much we do not know about landscape connectivity and how it should best be applied. However, what we *do* know compels us to action:

the loss of landscape connectivity is a major threat to biodiversity and requires immediate attention. The loss of landscape connectivity leads to ecosystem fragmentation, which contributes to a decline in biodiversity and threatens many species around the world (Bennett, 2003; Hilty et al., 2006; Millenium Ecosystem Assessment, 2005; Noss, 1987; UNEP, 2005). As explained in Chapter 1, the combination of habitat loss, habitat reduction, and habitat isolation that result from fragmentation serves to alter ecological processes and, in turn, affects wildlife and plant communities (Crooks and Sanjayan, 2006). These effects will be exacerbated by global climate change. Climate change poses a huge challenge to biodiversity conservation, as species that rely on geographically-fixed protected areas will face increasingly unsuitable habitat conditions and increasing threats from invasive species better adapted to the changing climate (Rahel et al, 2008; Williams et al., 2005). Dispersal, for those species that are sufficiently mobile, will be critical for continued survival and so the issue of planning for connectivity will become increasingly important. A number of recent studies have focused on climate change and connectivity (see Hannah et al., 2007; Rahel et al, 2008; Williams et al., 2005) and climate change is now being included in linkage design (Beier et al., 2008).

2.3 Planning and Conservation Biology

In order to better understand the challenges of planning for landscape connectivity, it is useful to examine the broader fields of planning and conservation biology. Conservation biology is an applied science of ecology with a mission of protecting and restoring biological diversity (Ehrenfeld, 2000; Pullin, 2002). Conservation biology draws upon a wide range of other disciplines, including anthropology, biogeography, ecology, economics, environmental studies, evolutionary biology, genetics, philosophy, population biology, sociology, and taxonomy (Brussard, 1991; Meffe and Carroll, 1997; Primack, 1998). Theories within conservation biology

include island biogeography, metapopulation theory, landscape connectivity theory, demographic theory, genetic theory, phylogenetic theory, ecosystem fragmentation, allometric/scaling and trophic interactions (see Meffe and Carroll, 1997; Primack, 2000; Pullin, 2002; With, 1997). Conservation biology thus provides an important theoretical framework for this dissertation, as it deals with theories central to landscape connectivity. Conservation biology is also important for this dissertation because of its relationship to land use planning. Murphy and Noon (2007) contend that conservation biologists must be engaged wherever possible in land use planning when natural systems, and the species they support, are at risk.

Conservation biology and land use planning are both interdisciplinary fields, have broad theoretical bases and deal with land use and landscape change on large spatial scales. The two fields are interrelated and becoming increasingly important to each other (Nassauer, 2006). Conservation biology is key to effective land use planning, as sound knowledge of conservation biology principles are needed in order to create plans that are, and will continue to be, ecologically sustainable. Land use planning is, in turn, a critical component of conservation biology strategies, as proactive planning is necessary to maximize the most efficient use of land before future options are foreclosed by further habitat change or destruction (Bennett, 2003). Solutions developed by conservation biologists will not work unless implemented by planners (Hobbs, 1997). Bissinger (1999) went so far as to argue that conservation biology should be moved into the field of urban planning. The relationship between the two disciplines has grown close in the last decade and is reflected in such journals as *Landscape and Urban Planning*, *Environmental Management*, and *Ecological Applications*, and the publication of texts that focus on planning for biodiversity (see Groves, 2003; Noss et al., 1997; Peck, 1998). Recent planning efforts have included regional, national, and continental-scale projects aimed at protecting biodiversity.

The following sections discuss in greater detail planning, conservation biology, and concepts of each that can be applied to landscape connectivity.

Planning

Definitions of planning abound (see Table 2.3) but, for the purposes of this dissertation, planning will be defined as "the integration of scientific and technical knowledge that provides options for making decisions about alternative futures" (Ndubisi, 1997, p. 10). This definition highlights the need for the integration of scientific knowledge and decision-making in the planning process and is appropriate for this study's locus in physical planning. Planning involves making decisions about the future and people from many other fields, such as conservation biology, engineering, law and politics, are involved in the process of planning. The planning focus of this dissertation is landscape and natural heritage planning. This focus is a natural extension of land use planning as land allocation based on economic and social bases, to include ecological functioning as a priority. This is often called landscape planning.

Table 2.3 Definitions of Planning

Planning…the process by which we attempt to shape the future (Brooks, 2002, p. 9).
Planning means the scientific, aesthetic, and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic and social efficiency, health and well-being of urban and rural communities (Canadian Institute of Planners, 2009).
Planning…future-oriented, public decision making directed toward attaining specific goals (Fainstein and Fainstein, 1996, p. 265).
This capacity to think in terms of experience larger than that which comes to any individual, to define distant goals, to arrange highly efficient ways and means of attaining them, and to pursue these distant ends consistently, yet with a flexibility which permits adjustment to changing conditions, is the dominant characteristic of…planning (Person 1934 from Friedmann, 1987, p. 421).

There are four currents of planning: physical, economic, social and public policy (Botequilha Leitao and Ahern, 2002). The main focus of physical planning is the allocation of land use. Landscape planning is a branch of physical planning that promotes the sustainable use of resources and management of the processes of landscape change (Ahern, 1999). The main goal of landscape planning today is (or should be) to "find ways of halting declines in biodiversity, to undo the damage created by poorly controlled or uncontrolled human activity, and to find sustainable ways to guarantee enhanced landscape quality for the future. Changes in biodiversity can be a measure of our success in reaching these goals" (Boothby, 2000, p. 282). As described by Ahern (2002, p. 187):

> Landscape planning is an inherently strategic activity. It strives to craft policies and actions that systematically address the trends and forces that shape and change landscapes…When strategic planning is informed by a landscape ecologically informed understanding of pattern: process dynamics, and is guided by appropriate spatial concepts, it may form a sound basis for plan development and implementation.
>
> In recent years, a growing environmental awareness and the increased

understanding of ecological systems brought about by conservation biology and landscape ecology has led to much interest in the practice and potential of landscape planning. It is within the field of landscape planning that the theory of landscape connectivity is addressed.

In Ontario, however, the type of planning that occurs for landscape connectivity is often referred to as natural heritage planning. Natural heritage is a term used to describe natural features and functions that have important environmental, social and economic values. The Natural Heritage Information Centre defines natural heritage as "all living organisms, natural areas and ecological communities which we inherit and leave to future generations" (OMNR, 2005). Woodlands, wetlands, valley lands, wildlife habitat, fish habitat, habitat of rare and endangered species, areas of natural and scientific interest (ANSIs), Environmentally Sensitive Areas (ESAs) and linkages between these natural features and areas form important components of natural heritage systems in Ontario. A natural heritage system, as defined by the Provincial Policy Statement (PPS) 2005, is a system consisting of natural heritage features and areas, linked together by natural corridors that are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems. Natural heritage systems can include areas that have been restored and areas that have the potential to be restored to their natural state.

The PPS requires planners in Ontario to *have regard for* natural heritage features and areas. The concept of natural heritage is increasingly being included in municipal and regional official plans and other policy documents. Natural heritage planning is gaining more awareness and visibility at the municipal and provincial levels in Ontario (Sullivan, 2004). Sullivan (2004) uses the interesting analogy of the butcher, the baker, and the candlestick maker to compare the respective positions of engineers, natural heritage planners, and biologists. He concludes that natural heritage planners, in

basing their positions upon accepted planning principles and involving stakeholders through a public process, tend to arrive at more moderate positions than either engineers or biologists. This may result in the loss of some habitat, or a development project that has been reduced in scale, but ultimately the project is more likely to serve the public interest and respect both economic and ecological agendas.

Planning Theory

Planning theory is difficult to define. Campbell and Fainstein (2001) suggest four reasons as to why the term is nebulous: 1) fundamental questions concerning planning belong to the broader inquiry concerning the role of the state in social and spatial transformation and so planning theory overlaps with theory in all of the social sciences and thus becomes difficult to limit or define as specific to planning; 2) boundaries between planners and professionals in related fields are not mutually exclusive; 3) planning can be defined by object (land use patterns) or by method (decision making process); and, 4) planning borrows diverse methodologies from many other fields and so its theoretical base is not easily delineated from its tools of analysis. The resulting disagreement over the scope, function and definition of planning itself makes it difficult to achieve consensus on a single definition of planning theory. There are a variety of planning theories currently in use. Table 2.4 (adapted from Brooks, 2002, p.80) presents four basic approaches; for detailed discussion of theories of and in planning, see Allmendinger, 2002; Brooks, 2002; Campbell and Fainstein, 2001; and Friedman, 1987.

Table 2.4 Typology of Planning Strategies

	Centralized	**Decentralized**
Rational	Rational comprehensive: Planner as applied scientist	Advocacy: Planner as political activist
Nonrational	Incrementalism: Planner confronts politics	Communicative action: Planner as communicator

(based on Brooks, 2002, p.80).

Of these four theories, rational comprehensive planning, despite criticism of its top-down, objective, and expert-based approach, remains the most widely used (Brooks, 2002). Rational comprehensive planning, first developed by Meyerson and Banfield in the early 1950s, involves goal setting, identifying policy alternatives, evaluation and implementation of decisions, and it favours technical knowledge and centralized decision-making. The other three planning strategies, which developed in response to shortcomings in the rational comprehensive model, recognize the political nature of planning and attempt to include stakeholder participation in the decision-making process (Brown and Harris, 2005). These theories take more of a `bottom-up' approach to the planning process.

The success of planning and its objectives depends largely on: 1) transparency by means of scientific underpinning, 2) methodological approach, and, 3) effectiveness of descriptive presentation (Petry, 2001). From a planning perspective, then, there are issues to be considered when approaching the problem of landscape connectivity. First, the planning approach should be scientifically grounded, yet encourage interdisciplinary participation. Second, the methodological approach must be carefully chosen as it may affect the ultimate success of the project. The rational comprehensive model of planning, with the planner as applied scientist, might seem appropriate for landscape connectivity, but its reductionist approach is not adequate for the complexity of landscape connectivity and it does not recognize the importance of public participation. Landscape connectivity requires an approach that recognizes both the

inherent complexity of the problem at hand and the dynamic role that humans play in the landscape.

In the next section, key concepts from conservation biology are shown to be important to landscape connectivity and they further influence the planning approaches chosen for this dissertation.

Conservation Biology

Conservation biology is a crisis discipline that emerged in response to the growing threat to biological diversity (Soulé, 1985). Biological diversity (also known as biodiversity), simply defined as the diversity of life on earth, occurs at many scales and thus conservation biology must take an holistic approach that aims to protect diversity at genetic, population, species, community, ecosystem, and landscape scales (Meffe and Carroll, 1997; Peck, 1998). The goals of conservation biology are threefold: 1) to maintain biological diversity (the natural diversity in living systems); 2) to maintain ecological integrity (the composition, structure and function of those systems); and, 3) to maintain ecological health (the resilience and ability of these systems to endure over time) (Trombulak et al., 2004).

MacArthur and Wilson's (1967) *The Theory of Island Biogeography* provided an early conceptual underpinning for the concept of applied ecology applied to landscape systems. In the 1970s, ground breaking work on Environmentally Sensitive Areas was done in Ontario, Canada (see Eagles and Adindu, 1978; Eagles, 1981; Eagles, 1984; Eagles, 1985). This work was the first attempt at taking ecology theory and developing applications within land use planning. This was largely reported in planning journals and books and was thus not widely read by biologists, often leading to a lack of recognition by biologists of this effort at moving from ecological theory to planning practice in Ontario in the 1970s. Conservation biology has therefore been recognized as a formal discipline in North America only since the 1980s with the

publication of Soulé and Wilcox's (1980) book *Conservation Biology: An Ecological-Evolutionary Perspective,* the inception of the Society for Conservation Biology in 1985 and the initial publication of its journal *Conservation Biology* in 1987 (the European journal *Biological Conservation* was first published in 1968).

Conservation biology is based on a set of normative postulates: 1) diversity of organisms is good (hence untimely extinction of populations and species is bad); 2) ecological complexity is good; 3) evolution is good; and, 4) biological diversity has intrinsic value (Soulé, 1985). Meffe and Carroll's (1997, pp.22-25) defining characteristics of conservation biology are summarized in Table 2.5.

Table 2.5 Characteristics of Conservation Biology

1	**A Crisis Discipline:** In such crisis disciplines, action must often be taken without complete knowledge, because waiting to collect the necessary data could mean inaction that would destroy the effort at hand. Such immediate action requires working with available information with the best intuition and creativity one can muster, while tolerating a great deal of uncertainty
2	**A Multi-disciplinary Science**: First is the melding of the formerly "pure" fields of population biology and ecology with the applied fields that encompass natural resource management. Second is the need for a strong philosophical foundation and input from the social sciences. Finally, conservation biology is a holistic field because conservation involves entire ecosystems and multi-disciplinary approaches and cooperation among disparate groups will be the most successful approach
3	**An Inexact Science**: Ecological systems are complex, often unique, and currently unpredictable beyond limited generalities. Uncertainty is inherently part of ecology and conservation, and probabilistic, rather than prescriptive, answers to problems are the norm
4	**A Value-Laden Science**: Conservation biologists should not delude themselves into thinking that their science is value-neutral. Its values are clearly defined: natural systems and biological diversity are good and should be conserved.
5	**A Science with an Evolutionary Time Scale**: In contrast to traditional resource management, whose currency includes maximum sustained yields, economic feasibility, and immediate public satisfaction with a product, the currency of conservation biology is long-term viability of ecosystems and preservation of biodiversity in perpetuity.
6	**A Science of Eternal Vigilance**: What appears secure today may well be exploited tomorrow for transitory resource use, and the conservation biologist must continually be protective of all natural areas and must stay on top of policy developments that affect conservation.

Theories within conservation biology include: island biogeography,

metapopulation theory, landscape connectivity theory, demographic theory, genetic theory, phylogenetic theory, ecosystem fragmentation, allometric/scaling, and trophic interactions (see Meffe and Carroll, 1997; Primack, 2000; Pullin, 2002; With, 1997). These theories are categorized into four levels: (1) genetic; (2) population/species; (3) ecosystem/community; and, (4) landscape (Meffe and Carroll, 1997; Noss et al., 1992; Primack, 1998). Three guiding principles for conservation biology can be drawn from this theoretical base: 1) evolution is the basic axiom that unites all of biology; 2) the ecological world is dynamic and largely non-equilibrium; and, 3) the human presence must be included in conservation planning (Meffe and Carroll, 1997).

Conservation Biology Concepts Useful for Landscape Connectivity Planning

A range of concepts useful for planning can be found in conservation biology (see Groves et al., 2003; Gutzwiller, 2002; Noss et al, 1997; Peck, 1998). In particular, the concepts of uncertainty, dynamic non-equilibrium, and scale make important contributions to planning theory as it relates to landscape connectivity.

Uncertainty: As noted by Soulé (1985), tolerating uncertainty is often necessary in conservation biology, as conservation biologists are required to make decisions before knowing all the facts and before being fully comfortable with the theoretical and empirical bases of their analysis. As noted by Egler, "Ecosystems are not only more complex than we think, they are more complex than we *can* think" (cited in Noss et al., 1997, p. 76). Conservation biology acknowledges that uncertainty is an inherent part of dealing with ecosystems. Planning that involves ecosystems, then, must account for uncertainty. Reductionism and other rational approaches to understanding the natural world are limited because we will never have a full understanding of how ecosystems work (Noss et al., 1997; Wiens, 2002). Thus, traditional rational comprehensive

planning theory is not fully adequate for dealing with complex environmental problems. Instead, planning must take a flexible and adaptive approach that allows for the inclusion of new data at various stages in the planning process. Also, it is critical that planners take the time to identify major knowledge gaps and be upfront with stakeholders as to the uncertainty inherent in the planning project (Noss et al., 1997; Groves, 2003; Peck, 1998). Being aware of, and dealing with, uncertainty as part of the planning process serves to decrease the overall risks.

In terms of planning for landscape connectivity, uncertainty is an important concept. Uncertainty exists in how best to protect and maintain connectivity and thus it requires an adaptive planning approach. It is also important, as noted above, that planners and conservation biologists be honest with stakeholders and decision-makers with regards to the level of uncertainty inherent in landscape connectivity projects (Beier et al., 2008; Rae et al., 2007). The case studies compared in this dissertation provide useful examples of how uncertainty can be factored into landscape connectivity projects, thus providing guidance for planners.

Dynamic Non-Equilibrium*:* The dynamic non-equilibrium paradigm is one of conservation biology's key principles. The classic paradigm in ecology into the 1970s was the equilibrium paradigm in which ecological systems were thought to be closed systems with self-regulating structure and function, and a definable set point such as a climax community (Meffe and Carroll, 1997). This balance of nature paradigm has been replaced in the last few decades by the dynamic non-equilibrium paradigm which recognizes that ecological systems are subject to episodic, natural disturbances that lead to changes in structure, function and processes (Meffe and Carroll, 1997; Noon and Dale, 2002). In short, nature is complex and often unpredictable. This new paradigm has a strong impact on planning for biological conservation. Earlier methods

of conservation were based on the balance of nature paradigm and the resulting islands of green that were created to protect habitat and species are now considered to be inadequate for long-term conservation as most reserves are too small to fully withstand major disturbances (Dobson et al., 1999; Soulé and Terborgh, 1999). The new planning approach to conservation involves creating and maintaining *linked* systems of habitat large enough to allow for flux and disturbance (Bennett, 1999). The paradigm of dynamic non-equilibrium has thus changed planning for conservation from a reactive approach (protecting static areas) to a proactive approach (anticipating and planning for flux).

In Ontario, this paradigm shift in planning began to occur in the late 1970s. Early criteria for ESA designation included the concept of landscape connectivity. Eagles and Adindu (1978, p. 46) listed nine criteria for selecting ESAs for designation in Regional Official Plans, the second of which was:

> "The ecological function of the area is vital to the healthy maintenance of a natural system beyond its boundaries, such as serving as a major water storage or recharge area, important wildlife migratory stopover or concentration point, or a linkage of suitable habitat between natural biological communities".

At the time of the first ESAs, however, this paradigm shift was still in progress and so the importance of maintaining linked systems of habitat large enough to allow for flux and disturbance was not yet fully recognized in Ontario's land use planning efforts.

The concept of dynamic non-equilibrium is important to planning for landscape connectivity not only because it leads to the recognition of the importance of linked systems of habitat but also because it requires that planners recognize the dynamic nature of fragmented landscapes. The conditions in habitat patches and the linkages between them will change over time, and thus planners must be prepared to plan for continued monitoring and management of linkages and land mosaics over long

time frames. Planning for landscape connectivity thus requires an adaptive, flexible approach that operates over sufficient large spatial and temporal scales. This dissertation provides examples of landscape connectivity projects that have attempted to make dynamism and change part of the planning process, thus providing planners with guidance and, perhaps, cautionary tales.

Scale: Scale is a key concept in conservation biology theory. Biological, spatial, and temporal scale must all be considered when dealing with problems in conservation biology. Appropriate choice of scale is key to studying specific problems and achieving useful and accurate results. Whereas planning for conservation historically focused largely on the site and local level, the recognition of the interdependencies of ecosystems requires planners to take a landscape approach that allows a site to be understood in its broader context (Botequilha Leitao and Ahern, 2002). Planners now need to address not just ecological patterns but also processes, and to plan over very long time frames (Knight and Landres, 2002). Conservation biology has recognized that if we are to conserve species, communities and ecosystems, we need to understand and maintain the ecological processes that shape those targets (Groves, 2003). Therefore, to address scale, planning must include the effects of ecological processes on the landscape. Conservation scientists are becoming increasingly adept at using spatial analyses and modeling to generate connectivity plans (Morrison and Boyce, 2008).

A hierarchical planning framework is necessary to address scale, and it should include goals, objectives and specific actions that correspond to different scales in space and time (Noss et al., 1997). A biodiversity framework is a useful tool for planners as it helps clarify the relationships between ecosystem components, patterns and processes at multiple levels of organization and provides guidance in deciding

what types of data to collect, which types of analysis might be important and which parts of the system should be monitored over a certain time scale (Peck, 1998). Throughout the planning process, planners must evaluate whether the data they are collecting and analyzing are at appropriate scales for the species or ecosystems that are the focus of the project, and to the processes and disturbances that sustain them (Groves et al., 2003).

Landscape connectivity is strongly scale-dependent and varies by species, spatial and temporal scale. Scale is thus a key concept for planners to consider in landscape connectivity projects (Hilty et al., 2006). Landscape connectivity projects are conducted at a variety of scales. Most commonly, they occur at the site/local scales, landscape scale, regional scale, bioregional scale, and continental scale. Some projects operate at more than one scale, and some authors differ in their definitions of each scale. For the purposes of this dissertation, local refers to small-scale projects that focus on a local ecosystem or ecosystems, landscape refers to larger areas that contain a combination of local ecosystems or land uses, regions are broad geographical areas with a shared microclimate and human activity, and bioregions are environmentally homogeneous areas independent of human boundaries (Forman, 1995; Lambeck and Hobbs, 2002).

From a planning perspective, the regional scale may provide too much environmental variation to be useful for conservation planning, while the bioregional scale tends to ignore human influences on the landscape (Lambeck and Hobbs, 2002). The landscape scale is widely-recommended as the most appropriate scale from which to plan for landscape connectivity (Bennett, 2003; Cushman et al., 2008; Groves, 2003; Hilty et al, 2006; Knight and Landres, 2002; Merriam, 1991). As explained by Bennett (2003, p. 165),

The landscape scale aspect of the approach is necessary to ensure that

> the planning framework is large in relation to the unit of land being managed. A broad perspective is necessary so that the planning process takes into account the wider ecological and social processes that shape and modify the natural environment in the particular study area.

Even local, small-scale connectivity projects must consider the larger landscape context in planning, design and evaluation of linkages because large-scale processes often influence local phenomena and, as time progresses, future connectivity projects will need to build on existing linkages and protected areas (Hilty et al., 2006).

2.4 Planning Approaches for Landscape Connectivity

Planning for landscape connectivity must address the conservation biology principles of uncertainty, unpredictability, and multiple scales[1]. The following three approaches to planning address these principles and serve as useful approaches to planning for landscape connectivity.

Landscape Ecological Planning

Landscape ecological planning is a branch of landscape planning that involves detailed knowledge of physical and biological systems, a hierarchical planning framework, and the application of conservation biology principles (Ahern, 1999; Botequilha Leitao and Ahern, 2002; Cowell, 1998). The key aspects of this method are: 1) the dynamic relationship between landscape pattern and process is fundamental to the planning process; 2) the planning process is interdisciplinary and integrates public and expert participation and advice; 3) the planning process is explicit, transparent and replicable; 4) the planning process should integrate knowledge, goals and spatial concepts in a strategic manner; and, 5) landscape planning is an iterative and

[1] Landscape connectivity must also take into account the social context, financial constraints, land tenure, and other factors that are very important to planning but may be neglected by biologists. See Chapter 7.

continuous process that integrates adaptive management (Ahern, 1999, pp. 181-183). This planning approach is thus explicitly designed to deal with uncertainty, dynamism and change.

The early approach to landscape planning, in contrast, followed the rational comprehensive model. The planning process consisted of "the brief, survey, analysis, planning, implementation and maintenance or husbanding" (Hackett, 1971, p. 26). The planner was instructed to keep the objective in mind at all stages of the planning process. According to Hackett, it was crucial that the survey and analysis work be completed before any planning work began, so that the planner would know the complete form and character of the landscape before any design work was initiated. The acceptance of the theory of dynamic non-equilibrium rendered this approach inadequate because the unpredictability and complexity inherent in ecological systems makes such a comprehensive analysis impossible. It would also be extremely expensive and time-consuming to conduct a survey that would provide complete ecological information for most land use planning projects.

Landscape ecological planning appears useful for the problem of landscape connectivity because it is an interdisciplinary, participatory and strategic planning approach that, as noted above, is designed to deal with uncertainty, dynamism and change; all of which are key to the success of landscape connectivity planning. However, landscape ecological planning is a new approach and working examples, such as those provided by this dissertation, are needed to prove (or disprove) its claims.

Adaptive Planning and Management

Adaptive planning and management was developed by Holling (1978) to help planners deal with the uncertainty inherent in environmental problems. Adaptive planning and management is learning by doing approach that follows a scientific, rational process but admits a level of ignorance about the workings of ecosystems and

the outcomes of management, and monitors the system to allow for adjustments in management (Noss et al., 1997; Peck, 1998). Indeed, the premise of adaptive planning and management is that our knowledge of the system we deal with is always incomplete (Walters and Holling, 1990). In adaptive planning and management, the planner acknowledges uncertainty, and then develops a range of viable actions that are designed to explore different aspects of the system being studied (Peck, 1998). Critical uncertainties are identified, the best available data on these uncertainties is gathered, and a monitoring and evaluation process is designed to track decisions (Lessard, 1998). In contrast with the rational comprehensive approach, the adaptive approach is cyclical, experimental, cautious, and leaves options for change open (Noss et al., 1997).

The adaptive planning and management approach has become an integral part of landscape ecological planning, ecosystem planning and management, as well as other ecologically-based planning theories. However, whether or not the government agencies, organizations and landowners involved in adaptive planning and management are truly able to act `adaptively' (and thus in contrast to long-standing management styles) remains to be seen, given the technical, economic, ecological, social and institutional barriers to implementation of adaptive management (Peck, 1998).

Ascher (2001, pp. 744-745) lists a number of ways that adaptive planning and management may be misapplied:

> Adaptive management depends on good adaptations. Perverse learning patterns lead to perverse adaptations, and perverse learning patterns may arise as a result of oversimplification in the face of complexity, or because the learning runs counter to institutional interests.
>
> Adaptation may be based on short-term considerations. For example, the time horizons of agency personnel tend to reflect both the institutional interests of the agency and the promotion incentives and other reward structures within the agency.
>
> Institutional constraints to adaptation may arise because an agency or its individual-members feel threatened by significant changes.

Despite the potential for misapplication, adaptive planning and management is a potentially important approach for landscape connectivity planning. As there is so much uncertainty involved with landscape connectivity, it is essential to use a planning approach that can not only adapt to change but also learn from it. Adaptive planning and management can also serve as a means of using science to integrate the planning and implementation phases of a project (Noss and Murphy, 1997).

Ecosystem Planning and Management

Ecosystem planning and management can be defined as the "integration of ecological knowledge within a socio-political and values framework toward the general goal of maintaining long-term ecosystem integrity" (Meyfarth, 2003, p. 132). Based on ecological, economic, and social factors, ecosystem planning and management has as much to do with the management of human activities as with the planning and management of ecosystems. Ecosystem planning and management represents a paradigm shift from linear comprehensive to cyclic-incremental or adaptive planning and management (Brussard et al., 1998). The rise of the environmental movement in the 1970s, growing attention to the biodiversity crisis and the concurrent acceptance of the ecosystem approach in ecology helped popularize this new approach. There are many existing definitions of ecosystem planning and management that vary according to the values of the group using the term. Vogt et al. (1999) suggest that it is easier to define ecosystem planning and management by what it is not: it is not multiple-use management, it is not a single species approach, and it is not grounded firmly in either biotechnologist or bioconservative ideals.

Ten common themes of ecosystem planning and management are: hierarchical context, ecological boundaries, ecological integrity, data collection, monitoring, adaptive management, interagency cooperation, organizational change, humans embedded in nature, and values (Grumbine, 1994, pp. 29-30). The conservation biology principle of scale is reflected in ecosystem planning/management's focus on

hierarchical context, in which a systems approach is used to address all levels of biodiversity. The importance of scale is also reflected in the themes of ecological boundaries, ecological integrity, interagency cooperation and organizational change, as planners and managers must work at ecologically appropriate scales that are greater than administrative, political and agency boundaries. This requires a level of cooperation and a need to plan over a much longer time scale than has been the norm thus far in planning. The themes of monitoring and adaptive management can help to reduce the ecological uncertainty inherent in biodiversity planning (Peck, 1998).

Ascher (2001, pp. 743-744) cautions that there are a series of possible perverse outcomes that may arise from the misapplication of ecosystem planning and management:

> If policy makers misconstrue ecosystem planning and management as requiring that the highest-level government dominate the process, ecosystem planning/management can deteriorate into a pawn of centralized control.
>
> Ecosystem planning and management can be interpreted as an argument for placing the main emphasis on information gathering and analysis, leading to inaction if the available data is considered inadequate, or to an emphasis on technical information that downplays the importance of qualitative analysis and rights-based appeals. There is also the danger of interagency competition prompting agencies to monopolize information.
>
> Ecosystem complexity leads to greater complexity in the intra- and interorganizational structures of resource management agencies, creating overlapping and shared responsibilities. This may encourage jurisdictional competition and even, in the case of resource organizations, resource exploitation as each party rushes to stake its claim.
>
> To cope with the vast complexity of entire ecosystems, ecosystem managers may look for ways to reduce complexity, such as applying the same regulations across different locales within ecosystem boundaries even if different approaches are warranted.

Landscape connectivity projects using ecosystem planning and management as their planning approach must take the above considerations into account. The complexity inherent in landscape connectivity necessitates a planning approach such as

ecosystem planning and management that is designed to deal with complexity.

In summary, landscape ecological planning, adaptive planning, and management and ecosystem planning and management all contain elements useful for landscape connectivity planning as they address the concepts of uncertainty, scale and dynamic non-equilibrium. Each approach has its strengths and weaknesses, and so it is important that planners carefully assess each before deciding which approach to use in a particular project. Planners may choose to use more than one approach. For example, the Georgian Bay Islands National Park `Cores and Corridors Project', initiated in 1994, uses adaptive planning and management and ecosystem planning and management as its planning approaches (Zorn and Quirouette, 2002). These approaches were chosen to address the uncertainty inherent in ecological network design and the need to approach the problem from multiple scales.

Landscape Connectivity and Urban and Regional Planning

Planning for landscape connectivity commonly occurs within the fields of urban and regional planning. Urban and regional planning address different planning issues, objectives and jurisdictional arrangements, but they share a common goal of protecting the natural environment. Urban planning deals with the built urban environment and issues involving quality of urban life, the control of land use for urban development, and the protection and enhancement of the natural environment. Regional planning addresses a geographical area that is larger than a single jurisdiction, focuses on the location of human activities and resource development; and includes environmental, social and economic factors. Urban planning operates at the local and landscape scale while regional planning takes place at the regional and bioregional scale.

Much of the emphasis in the landscape connectivity literature is on the importance of regional planning, but planning decisions made at the municipal or local level are also of great importance to landscape connectivity. As noted by Brody et al.

(2003), local level planning must be considered along with other spatial and jurisdictional scales when managing ecosystems because many of the factors negatively affecting ecosystems, like rapid urban development and habitat fragmentation, occur at the local level as a result of local land use decisions. Under Ontario's planning system, many land use decisions are made at the municipal level, and municipalities and conservation authorities are largely responsible for the implementation of linkage programs on private land.

Despite controversy surrounding the use of linkages, they remain a popular method of applying landscape connectivity theory within urban and regional planning (Vos et al., 2002). For example, by the year 2000 most plans made by local and regional planning authorities in the United Kingdom included wildlife corridors, with specific policy guidance for their implementation (Dover, 2000). Planners use different types of linkages at different scales (see Table 2.4). Planning for biodiversity may require applying several linkages at different scales in the same landscape (Vos et al. 2002). For detailed information on linkage design, see Beier at al. (2008), Bennett (2003), Dobson et al. (1999), Fleury and Brown (1997), OMNR (2000), Rouget at al. (2008).

There are a variety of methods of implementing landscape connectivity theory and practice in urban and regional planning. Regulatory tools include planning acts, policies (e.g. natural heritage systems, urban growth), municipal official plans, and conservation authority regulation. For example, Germany has a statutory landscape planning system that defines goals and objectives for land use development from a nature conservation perspective that requires that habitat networks cover a minimum 10% of the total land area of the German states (Petry, 2001; von Haaren and Reich, 2006). Ontario has incorporated landscape connectivity theory into legislation on a regional scale (see the *Oak Ridges Moraine Conservation Act, 2001* and the *Greenbelt Protection Act, 2004*).

Non-regulatory tools for implementing landscape connectivity include land

stewardship programs and incentives, public education, informal agreements amongst local communities, and land securement options. As land ownership of linkages may lie partly or fully with local communities rather than governments, non-regulatory planning tools may be more effective at the local level than regulatory measures (Bennett, 1999). In their assessment of the proposed Algonquin to Adirondack Corridor project, Brown and Harris (2005) suggest that citizen participation is key to the success of this large-scale linkage project and they recommend a bottom-up planning approach.

Along with local and landscape level linkages, urban and regional planners apply a variety of other methods that incorporate varying degrees of landscape connectivity principles. Greenways, greenbelts, regional corridors and ecological reserve networks are used globally.

Opportunities and Constraints

Planners face inherent opportunities and constraints in applying landscape connectivity theory. Opportunities and constraints are discussed below.

Opportunities: A major paradigm for planning is concern for environmental quality and long-term livability of urban areas (Flores et al., 1998). Landscape connectivity theory can be used to further ecological goals of urban planners while also addressing other goals such as recreation, floodplain protection, and neighbourhood beautification. For example, the application of landscape connectivity theory through the implementation of greenways provides an important opportunity for people living in urban areas to reconnect physically and psychologically with the natural world (Ahern, 2004). Landscape connectivity theory can also be used as part of a larger conservation strategy and linkages can be used to achieve conservation policy goals.

Landscape connectivity theory is intuitively appealing and relatively easy to explain. Planners are thus able to communicate their ideas regarding landscape connectivity to a non-technical audience with minimal difficulty. Landscape connectivity concepts map very well, which also increases planners' ability to share

their ideas effectively. This is useful when it comes to involving and educating stakeholders in the planning process. Stakeholder participation is key to the success of landscape connectivity projects, especially as connectivity projects often involve both public and privately-owned lands. As noted by Groves (2003), one of the most important aspects of implementing conservation planning principles is ensuring that the people who have a major stake in the outcome understand, are engaged in, and are supportive of both the process and the results.

Planning proactively for landscape connectivity is much simpler, less expensive and ecologically more effective than trying to restore landscape connectivity after natural connections have been lost (Bennett, 1999). Conservation biologists and planners may invoke the precautionary principle when making their case for landscape connectivity. The precautionary principle requires action in anticipation of harm, in order to prevent it (Noss et al., 1997). First developed in the field of international environmental law, this decision-making principle is invoked in situations that are both large in scale and fraught with uncertainty (Groves 2003; Noss et al., 1997). Whereas the traditional hypothetical-deductive science approach to a problem puts the burden of proof on, for example, those trying to predict and prevent harmful effects of a proposed land use or development, the precautionary principle require those proposing the development to prove that it will not have harmful effects. Thus, in the case of landscape connectivity, it can be argued, "those who would destroy the last remnants of natural connectivity should bear the burden of proof that corridor destruction will not harm target populations" (Beier and Noss, 1998, p. 1250). This principle is important for landscape connectivity planning as it can be used to justify taking action to protect connectivity, despite uncertainty caused by the debate over the value of conservation linkages or corridors.

However, the precautionary principle can also be used to stall decision-making indefinitely. Many scientists are loath to make decisions in the absence of complete information. Since it is very expensive in time and money to collect complete

information for most land use planning projects, it is possible to reasonably argue that nothing should go forward until all information is available. This open-ended concept makes the precautionary principle very difficult to use in most land use planning. The challenge to the precautionary approach, as noted by Rae et al. (2007), is finding the balance between transparency and information over-load, which can confuse decision-makers and substantially lengthen deliberation times.

Constraints: Along with the theoretical gaps in understanding, there is a range of practical constraints involved with landscape connectivity in urban and regional planning. The use of linkages is an appealing concept to planners but, just as lines on a map between natural areas are easily drawn, the linkage concept may be applied too easily without proper study of its potential for effectiveness (Hannon and Schmiegelow, 2002; Vos et al., 1999). Planners are guilty of practicing `quasi-science' when they use concepts of landscape connectivity without fully understanding the theory and science on which those concepts are based.

Landscape connectivity planning also faces constraints in terms of interpretation. Interpreting large-scale data, both conceptually and technologically, can be a limiting factor in achieving conservation goals (Bunn et al., 2000). As noted by Rae et al. (2007), uncertainty will always be present in spatial modeling and can lead to misinterpretation of results and costly (and often irreversible) mistakes in land planning decisions. To use an example in urban planning, two municipal planners, armed with the same background data and maps, can come up with very different landscape connectivity plans for a proposed housing subdivision. This can raise serious problems when it comes time to make decisions about site plans, particularly if policy directions are unclear. Although attempts have been made to create planning frameworks for linkage design (see Fleury and Brown, 1997), there is as yet no definitive methodology for planners because the gaps in scientific understanding remain significant and because planning for linkages is of necessity so complex. In addition, confusion over

landscape connectivity terminology leads to confusion over the purpose and status of linkages, thus preventing consistency of approach between planning authorities, information exchange and coordination and implementation of policies (Dover, 2000).

As noted by Bennett (2003), planning at broad spatial scales also poses a challenge because the broader the scale, the greater the range of land managers and types of land tenure that must be coordinated to accomplish the overall goal. Administrative boundaries tend to ignore ecological boundaries and thus represent a major limitation to effective connectivity planning (Dover, 2000). Indeed, joining the variety of agencies and private groups into a unified approach to planning for conservation is a huge challenge (Noss et al., 1997). Landscape connectivity must be planned for at the landscape level or greater, and requires intergovernmental coordination, public support and the cooperation, or at least the acquiescence, of private landowners.

There is no strong theoretical framework to guide planners in dealing with a range of species and processes operating at different spatial scales, and the science of scaling up and down among local, landscape and regional scales is still poorly developed (Lambeck and Hobbs, 2002). This can lead to confusion, inaccurate results and difficulty in comparing case studies.

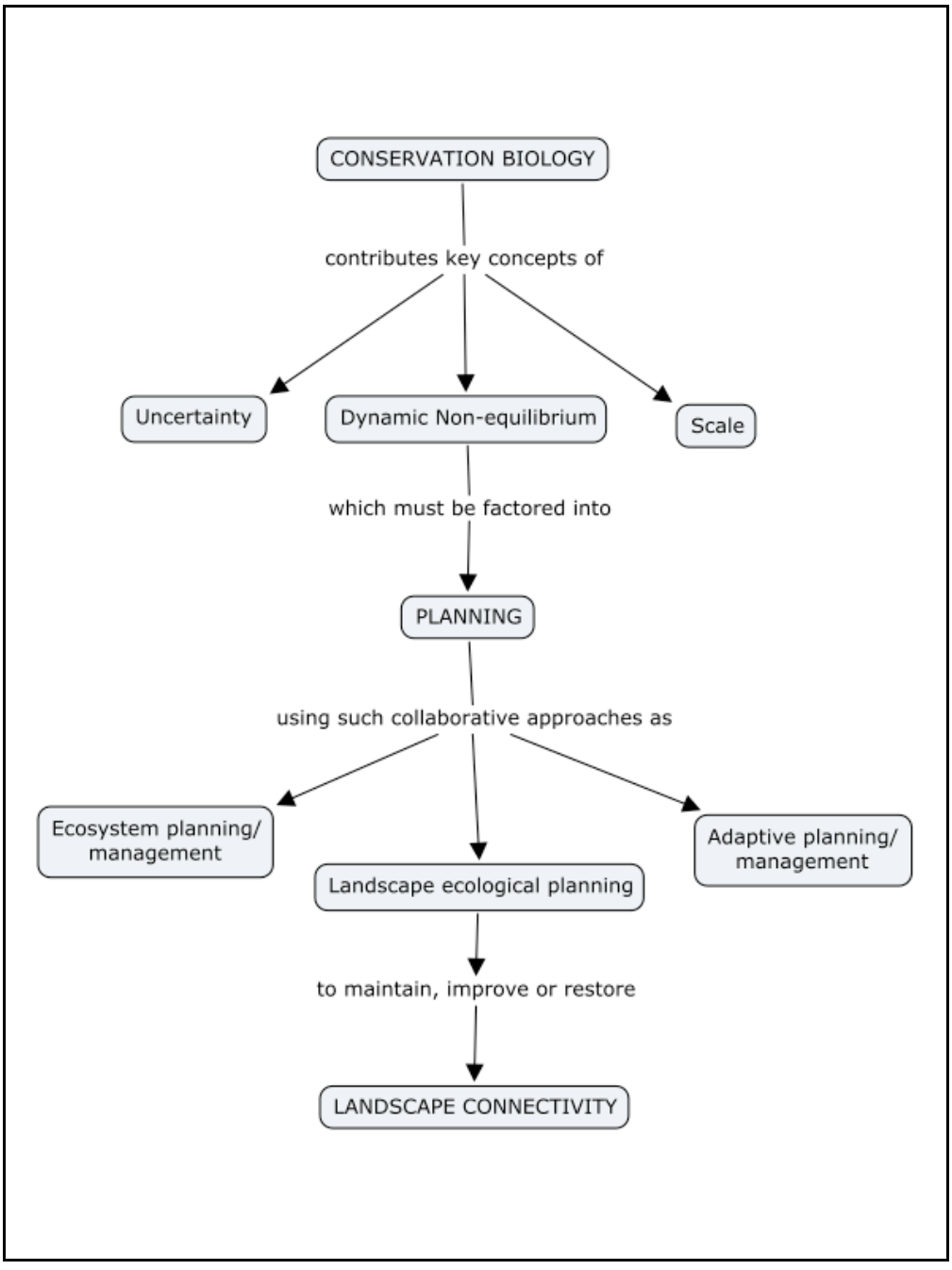
Monitoring and adaptive management are critical components of landscape connectivity plans, yet they are not always adequately addressed. The long-term monitoring and management of linkage projects can be expensive: government agencies, conservation organizations, and community groups may have insufficient funding. There is also potential for conflict with stakeholders who “fear that information contrary to their interests may be uncovered” (Peck, 1998, p. 159). For example, a development group or a municipality might discourage monitoring of wildlife linkages through their newly-built subdivision for fear that the linkages might prove to be ineffective. Without monitoring and management, however, there can be no evaluation of a project's success or failure.

A final constraint in applying landscape connectivity in urban and regional planning lies with policy. The challenge is to ensure that the ecological working of landscape is not relegated to a secondary role, but instead becomes the *raison d'être* for landscape planning (Boothby, 2000). When ecological integrity is one of several goals, as is frequently the case in landscape connectivity projects, it may lose out to more politically popular issues such as economics and public safety. For long-term maintenance of landscape connectivity to be effective, ecological goals must be paramount.

2.5 Conclusion

The literature review presented in the previous sections reviewed and discussed theories, concepts and principles that form the theoretical and conceptual framework for this dissertation. The principles of scale, uncertainty, and dynamic non-equilibrium are of great importance to the study of landscape connectivity and they must be adequately addressed by planning frameworks if landscape connectivity projects are to achieve their goals (see Figure 2.3). Landscape connectivity is interdisciplinary, deals with spatial, biological and temporal analyses at multiple scales and must include human influences. There is an emerging practice of applying landscape connectivity to land use planning. An integrated, interdisciplinary and flexible planning approach is thus required. The following chapter presents details on the research methodology, research design, research quality and limitations of the program of research for this dissertation.

Figure 2.3 Conceptual Framework



3 Methodology and Methods

3.1 Introduction

Chapter 3 presents the research methodology, research design, research standards and limitations of the program of research. The main research question is:

> ***How has the theory of landscape connectivity been applied in land use planning policy and practice between 1970 and 2008 in Ontario, Canada?***

Subsets to this main question are:

> ***To what degree has there been a movement from theory to practice in landscape connectivity planning?***
>
> ***What circumstances facilitated the movement from theory to practice in planning for landscape connectivity?***

The research approach taken to answer these questions is qualitative. The research design includes a literature review, content analysis, and case study research.

3.2 Research Methodology

This dissertation employs a qualitative research methodology. In a qualitative approach, the researcher uses multiple methods, which are interactive and humanistic, to collect open-ended, emerging data involving text and images with the primary intent of developing themes from the data (Creswell, 2003). Qualitative research is interpretive, exploratory, and largely inductive. In contrast to quantitative research, which tests or verifies predetermined theories or explanations, qualitative research looks for the theory or general pattern of understanding to emerge, beginning with initial codes, developing into broad themes, and coalescing into a grounded theory or broad interpretation (Creswell, 2003).

The concept central to this dissertation is landscape connectivity, which is

interdisciplinary, deals with spatial, biological and temporal analysis at multiple scales and must factor in human influences (Ahern, 1999; Bennett, 2003; Crooks and Sanjayan, 2006). Planning for landscape connectivity requires an integrated, interdisciplinary approach (Ahern, 1999; Kleyer at al., 1996; Linehan and Gross, 1998; Opdam et al., 2002). Accordingly, this dissertation draws from several different fields (conservation biology, landscape ecology and land use planning) and integrates the results into a comprehensive examination of the reality of planning for landscape connectivity in Ontario. A qualitative approach is useful for this in-depth exploration of planning for landscape connectivity. Using a qualitative approach enabled the identification of important themes as they emerged from the data and, because the qualitative approach is also flexible and iterative, also allowed the inclusion of new ideas and the modification of methods as the research developed.

The following subsections provide a brief description of the research methods used in this dissertation. Further details are provided in Section 3.4.

Literature Review

Researchers use a literature review to present results of similar studies, to relate the current study to ongoing advancements in the scholarly literature, and to provide a framework for the research problem (Creswell, 2003). The first literature review for this dissertation traced the evolution of the concept of landscape connectivity, discussed landscape connectivity theory, and summarized broad themes in the landscape connectivity and planning literature. It provided the theoretical and conceptual background for the dissertation research. The second literature review established timelines for the introduction of landscape connectivity in the academic literature and the introduction of natural heritage policy in Ontario.

Content Analysis

Content analysis is an empirically-grounded, often quantitative, method "for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff, 2004, p. 18). Content analysis can be used in both qualitative and quantitative research. Some advantages of content analysis as a research method are: 1) it is an unobtrusive technique; 2) it can handle unstructured matter as data; 3) it is context sensitive and allows the researcher to process as data texts that are significant, meaningful, informative and representational to others; 4) it can handle large volumes of data; 5) the data for content analysis is often easily accessible for the researcher; and, 6) the analysis itself can be repeated by the researcher or others to test the reliability of the results (Krippendorff, 2004).

Some disadvantages of content analysis as a research method are: 1) it can be very time-consuming, 2) it is inherently reductive; 3) if done incorrectly, it may ignore context, lack a theoretical base or attempt to draw relationships where none exist.

Content analysis is more than a simple word count: it can be put to many uses, including extrapolations, standards, indices and symptoms, linguistic representations, conversations and institutional processes (Krippendorff, 2004). For the purposes of this dissertation, it is used to examine trends and patterns in Ontario's land use planning legislation, policies and relevant supporting documents with regards to the concept of landscape connectivity. The research design for this content analysis takes the form of a problem-driven content analysis. A problem-driven content analysis is driven by epistemic questions about phenomena, events or processes; the answers to which the analyst believes can be found by a systematic reading of relevant texts (Krippendorff, 2004).

Case Study Research

Case study research involves exploring in-depth processes, activities and events using a variety of data collection procedures (Creswell, 2003). Case studies are bounded by time and activity (Stake, 1995). Some advantages of using the case study as a research method are: 1) it can provide very detailed information; 2) it is a flexible method which allows the researcher to begin with broad questions and then define their focus; and, 3) it places an emphasis on context. Two disadvantages of using case studies are that results are difficult to generalize and case study research is inherently subjective.

This dissertation uses collective case studies. Multiple or collective case studies are commonly used in qualitative research to make comparisons, propose generalizations, and build theory (Leedy and Ormond, 2001). The case studies are also used here to identify factors that promote or impede planning for landscape connectivity. This is known as an instrumental case study approach as it focuses on specific issues of the case that are of interest (Stake, 1995; Creswell, 1998).

3.3 Analytical Framework

The analytical framework of this dissertation is based on Ahern's framework for landscape ecological planning (Ahern, 1999). It has been altered, based on results of Chapter Two's literature review, to make the framework more useful for the problem of landscape connectivity (see Figure 3.1).

Figure 3.1 Analytical Framework

(based on Ahern, 1999)

This framework was applied to the case studies in Chapter 7, first to focus on important areas of analysis and then to identify specific themes and concepts.

3.4 Study Delimitations

This study is set in Ontario, Canada and is confined to the specific time period of 1970 to 2008. The year 1970 was chosen as the starting date because key theories

were introduced around that time: MacArthur and Wilson published *The Theory of Island Biogeography* in 1967 and Levins introduced metapopulation theory in 1970. The 1970s also marked the introduction of planning for Environmentally Sensitive Areas in Ontario (see Eagles and Adindu, 1978; Eagles, 1981; Eagles, 1984; Eagles, 1985), which subsequently spread worldwide. January 2008 was chosen as the end date for pragmatic reasons, namely time constraints on the part of the researcher.

Ontario provides an excellent context for research into planning for landscape connectivity because it has included concepts of landscape connectivity in provincial planning of crown land at a regional scale, legislation affecting private land at a regional scale, and policy affecting all land use planning at a municipal level. Given that the province is an ecologically diverse and species rich area, large parts are threatened by fragmentation and by increasing pressures on remaining habitat as the human population in the south of the province continues to grow and as demands for natural resource development, such as mining, increase in the north.

Ontario's geographical size is 107 million hectares and its wide-ranging climate and geology have resulted in a diverse mix of ecoregions that provide habitat for more than 80 species of mammals, more than 470 species of birds, 60 species of reptiles and amphibians, over 160 species of fish, over 20,000 species of insects, spiders and other invertebrates, over 3,380 species of plants, over 1,000 species of fungi and algae and hundreds of species of lichens and mosses (OMNR, 2005). Ontario, with a human population of 12,803,900, is Canada's most heavily populated province (Statistics Canada, 2007). Much of Ontario's population is concentrated in the south, where increasing urban, suburban and rural development puts great pressure on remaining available habitat. *Ontario's Biodiversity Strategy 2005* cites habitat loss, alteration and fragmentation as serious threats to the province's biodiversity. According to the Committee on the Status of Endangered Species in Canada, 181 of the 516 plant and

wildlife species currently considered to be "at risk" in Canada are located in Ontario (Environment Canada, 2006). This is the highest percentage of species at risk in Canada, and the majority of these species are located in the south of the province, the mostly highly fragmented area. Habitat loss, including alteration and fragmentation, is the main threat for 67% of Ontario's species at risk (ECO, 2009).

Human-induced ecosystem fragmentation has been an issue in Ontario for the past century and remains a serious problem for Southern Ontario (ECO, 2000; Wilkinson, 2001). In response, there has been considerable application of landscape connectivity theory in land use planning practice, law and regulation in Ontario over the last decade. For example, Ontario incorporated landscape connectivity theory into legislation covering land use planning on a regional scale in the *Oak Ridges Moraine Conservation Act, 2001* and the *Greenbelt Protection Act, 2005*. The *Oak Ridges Moraine Conservation Act, 2001* states the objectives of the Oak Ridges Moraine Conservation Plan, which includes,

> (d) ensuring that the Oak Ridges Moraine Area is maintained as a continuous natural landform and environment for the benefit of present and future generations.

This objective supports the concept of landscape connectivity as something to be maintained for the long term.

The *Greenbelt Protection Act, 2005* states the objectives of the Greenbelt Plan, which is to be carried out under the Greenbelt Protection Act. Of these objectives, three pertain directly to landscape connectivity:

> (a) to establish a network of countryside and open space areas which supports the Oak Ridges Moraine and the Niagara Escarpment;
> (f) to promote connections between lakes and the Oak Ridges Moraine and Niagara Escarpment;
> (h) to promote linkages between ecosystems and provincial parks or public lands;
>
> These objectives direct planners to support and promote linkages.

In addition, the Provincial Policy Statement (PPS) under the *Planning Act* requires planners at a local scale to address landscape connectivity and linkages. Section 2.1.2 of the PPS 2005 states:

> The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

Thus planners at the local scale in Ontario should *have regard to* maintaining, restoring or, where possible, improving landscape connectivity.

The Government of Ontario's Lands for Life (L4L) planning process incorporated the concept of landscape connectivity within provincial crown land on a regional scale. The L4L process was an extensive regional land use planning exercise carried out by the Government of Ontario between February 1997 and May 1999 (OMNR, 1999). The resulting *Ontario's Living Lands Use Strategy* set a framework for future land and resource management on Crown lands in the planning area. Although landscape connectivity is not strongly represented in this strategy, it does contain numerous references to ecological linkages, connections and corridors between parks and protected areas.

3.5 Research Design

The research design for this dissertation includes literature reviews, content analysis, and case study research. The research was conducted in four phases following a period of background preparation. It is important to note that this was not a linear, but an iterative process, with cycling between the different phases as new discoveries and understandings arose on the part of the researcher.

Literature Reviews

The literature review in Chapter 2 is: 1) historical, as it traces the evolution of landscape connectivity; 2) theoretical, as it discusses thinking on landscape connectivity; and, 3) integrative, as it summarizes broad themes in the landscape connectivity and planning literature. It consists of a comprehensive review of the theories, concepts and principles important to planning for landscape connectivity. The concept of landscape connectivity and its theoretical bases (island biogeography, metapopulation theory and landscape ecology) are reviewed and gaps in understanding are outlined. Next, the fields of planning and conservation biology are reviewed with an emphasis on the how the concepts of uncertainty, dynamic non-equilibrium and scale play an important role in shaping this dissertation's approach to the problem of landscape connectivity. This literature review forms the theoretical and conceptual background for this dissertation research.

A second literature review was conducted following the selection of the study location, time period and case studies. The purpose of this second literature review was to establish a timeline for the introduction of landscape connectivity in the academic literature and contrast it with a timeline for the introduction of natural heritage policy in Ontario, thereby shedding light on the movement from theory to practice in planning for landscape connectivity in the province, as illustrated by Chapter 4.

Document review provided another important source of data for this dissertation. Documents relevant to planning for landscape connectivity in Ontario, including legislation, policies, Ontario Municipal Board reports, guiding documents, project reports, secondary plans and subwatershed studies were used for the content analysis in Chapter 5 and the case studies in Chapters 6 and 7. See Appendix A for full list of documents.

Content Analysis

Chapter 5 presents a content analysis of Ontario's land use planning legislation, policies and supporting documents for landscape connectivity content between January 1970 and January 2008. The research question for this problem-driven content analysis is: *How does Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity in the 1970-2008 period?* The context for this content analysis is the field of land use planning within Ontario. The 48 texts chosen for analysis are documents used for guidance and for reference that inform planners and the planning process in the Province. Intended readers of the relevant texts are planners, practitioners in a field related to planning, or other practitioners interested in some aspect of the planning process. Full details of the research design for the content analysis are presented in Chapter 5.

Case Studies

Chapters 6 and 7 focus on case studies. In Chapter 6, a summary of cases is presented and analyzed for the manner in which the landscape connectivity provisions of relevant legislation and policies were interpreted and applied by the Ontario Municipal Board (OMB). The cases were selected using a series of keyword searches in the OMB E-Decisions database. Thirty-six cases were summarized in a standard format to facilitate a comparative analysis. Full details of the research design for this analysis are presented in Chapter 6.

The four case studies in Chapter 7 were purposively selected to represent the spectrum of land use planning in Ontario with regard to landscape connectivity. The three criteria for case study selection were as follows:

Scale: The cases were selected to represent the regional, landscape and local scales of landscape connectivity planning.

Planning Authorities: The cases were selected to represent a variety of land use

planning in Ontario, namely provincial planning, municipal planning, private planning, and conservation authorities' planning.

Guiding Documents: The cases were selected to represent the different legislation, policies and guidelines that apply to landscape connectivity planning in Ontario.

Based on the above criteria, four case studies were selected:

Lands for Life Planning Process. The Lands for Life (L4L) process was the Ontario government's regional land use planning for Crown land in Northern Ontario, which took place between February 1997 and May 1999. The L4L planning area included 45% of Ontario's total land area and thus the resultant land use plans covered a very large area. This case study is at the regional scale.

Oak Ridges Moraine Planning Process. The Oak Ridges Moraine (ORM) was the focus of an intense land use conflict in Southern Ontario that resulted in the passing of provincial legislation (*Oak Ridges Moraine Conservation Act* 2001) and a plan (Oak Ridges Moraine Conservation Plan 2002). The ORM case set an important precedent in Canada (and possibly the world) as it marked the first time that long, wide conservation corridors on private lands were regulated through land use legislation (Whitelaw and Eagles, 2007). This case study is at the regional scale.

Raisin Region Conservation Authority Natural Heritage Strategy. The Raisin Region Conservation Authority (RRCA) is responsible for managing a watershed in Eastern Ontario. Their recent Natural Heritage Strategy (NHS) recognized the importance of maintaining linkages at the landscape level and the challenges of planning for linkages on predominantly private land. This case study is at the landscape scale.

North Oakville East Secondary Planning Process. The North Oakville East Secondary Plan was developed for the northward urban expansion of the Town of Oakville. It was the focus of long and intense negotiations between the municipality and private developers. The planning process included two separate subwatershed studies and two separate subwatershed plans, with the municipal planners and the private planners each presenting a different Natural Heritage System for the suburban site. This case study is at the local scale.

Role of the Researcher

Qualitative data analysis requires the researcher to filter data through a personal lens that is situated in a specific sociopolitical and historical moment (Creswell, 2003). My role as the researcher is to interpret the data I collect while being mindful of my own biases. This dissertation focuses on terrestrial landscape connectivity, for example, not because it is more important than hydrological connectivity but because I have a personal interest in terrestrial connectivity. Similarly, I chose to focus on the use of linkages, as opposed to managing the matrix, as a means of maintaining connectivity. It is also important to note that I was involved professionally with three of the cases presented in this thesis. I assisted with the development of the Natural Heritage System on the North Oakville East Lands (see Eagles, P.F.J. and Meyfarth O'Hara, E., 2004). I completed the final phase of the Raisin Region Conservation Authority's Natural Heritage Strategy (see Meyfarth O'Hara, E., 2005). I wrote a report for the Environmental Commissioner of Ontario that examined the manner in which the natural heritage provisions of the 2005 PPS under the *Planning Act* were interpreted and applied by the OMB between January 2004 and January 2008, which is presented in Chapter 6 as part of the comparative

analysis (see Meyfarth O'Hara, 2008). My perspectives and professional practice have shaped the course of my research.

I have an academic background in conservation biology and planning that has provided me with an understanding of the theoretical domain of landscape connectivity, and I also have practical experience in the empirical and applied domains of connectivity conservation. My current interest lies in the intersection among these three domains, where knowledge gleaned through theoretical, empirical and applied research is synthesized into connectivity conservation. This dissertation focuses specifically on the overlapping area between theoretical and applied connectivity studies wherein implementation occurs.

3.6 Research Standards and Limitations

Validity, reliability, and generalizability are commonly used to assess the quality of research findings. Validity refers to the truthfulness of results and is indicative of the soundness of the research design and methods. Reliability refers to the stability or consistency of responses. A research procedure is said to be reliable if it responds to the same phenomena in the same way regardless of the circumstances of its implementation (Krippendorff, 2004). Generalizability refers to the external validity of applying the research results to new settings or samples. As noted by Creswell (2003), validity is considered to be a strength of qualitative research while reliability and generalizability play a minor role in qualitative inquiry. Validity, reliability and generalizability are discussed below as they relate to this dissertation.

Validity: According to Creswell, there are three types of validity: 1) Content validity: Do the items measure the content they were intended to measure?; 2) Predictive or concurrent validity: Do scores predict a criterion measure? Do results correlate with

other results?; and, 3) Construct validity: Do items measure hypothetical constructs or concepts? Creswell (2003, p. 196) lists eight strategies for checking the validity of qualitative research findings:

1. Triangulate different data sources.
2. Use member-checking by participants to determine accuracy of findings.
3. Use rich, thick description to convey findings.
4. Clarify researcher bias.
5. Present negative or discrepant information that runs counter to themes.
6. Spend prolonged time in the field.
7. Use peer-debriefing to enhance accuracy.
8. Use an external auditor to review the entire project.

This dissertation employs several of these strategies, including triangulation, clarification of researcher bias, peer-debriefing and use of an external auditor.

Triangulation: Triangulation is used in qualitative research as a means of verifying the validity of research findings. It refers to the process of using multiple research methods, data sources, researchers, or theories to study the same phenomenon. In the case of this dissertation, the literature review, content analysis and case studies provide a triangulation of methods.

Clarification of researcher bias*:* I acknowledged my perspectives in Section 3.5 and attempted to keep them in mind throughout the research process.

Peer-debriefing*:* This involves enlisting the assistance of a peer to enhance the accuracy of the research by reviewing and questioning the study (Creswell, 2003). I enlisted the help a registered planner and policy analyst to read and critique my draft dissertation.

***External auditor**:* An external auditor is someone new to both the researcher and the project who can provide an assessment either throughout the research process or at the end of the study (Creswell, 2003). The external examiner for this dissertation defense can be considered an external auditor, as can the PhD Advisory Committee members.

Reliability: In order to enhance reliability, I have provided detailed descriptions of my research methods and results. The second literature search is repeatable and, as it is limited by a set time frame, the results would be the same. The content analysis is also repeatable.

Generalizability: The results of this dissertation are not generalizable but they are transferable in that the findings could be applied to other settings/situations with similar conditions.

3.7 Conclusion

This chapter has presented details on the research methodology, research design, research standards and limitations of my program of research. The research approach is qualitative and the research design includes a literature review, content analysis, and case study research. The following chapter presents the results of a literature review that establishes a timeline for the introduction of landscape connectivity in the academic literature and the introduction of natural heritage policy in Ontario.

4 Land Use Planning in Ontario

4.1 Introduction

Chapter 4 presents a history of Ontario's land use planning system, an overview of the development of natural heritage policy in Ontario, and an introductory examination of the movement from theory to practice in planning for landscape connectivity in the province of Ontario.

4.2 Land Use Planning in Ontario

Ontario operates under a policy-led planning system. Land use planning on private land is conducted under authority of the *Planning Act*, which is provincial legislation that sets the rules for land use in the province. The Provincial Policy Statement (PPS) provides the broad policy framework that establishes direction on matters of provincial interest. The PPS was created by the provincial government under the authority given to it by the *Planning Act*. Although the province sets legislation and policies, planning decisions for private land are made at the municipal level. Municipalities are responsible for implementing the *Planning Act* via their Official Plans, zoning by-laws, and development application approval processes. The Ministry of Municipal Affairs and Housing (MMAH) is responsible for plan input and review, policy development and appeals. The Ontario Municipal Board (OMB) is an independent, adjudicative tribunal that is responsible for settling disputes over land use planning and other municipal issues. The OMB hears appeals and applications on land use planning under the *Planning Act* and other legislation.

Land use planning on private land is also influenced by Conservation Authorities under authority of the *Conservation Authorities Act.* Conservation authorities are local, community-based watershed management agencies that deliver services and programs that protect natural resources in partnership with government, landowners and other organizations. Land use planning on Crown land (public land) is conducted by the Ministry of Natural Resources (MNR) under authority of the *Public*

Lands Act. In addition, provincial ministries and local governments are responsible for environmental planning under authority of the *Environmental Assessment Act*, which is administered by the Ministry of the Environment (MOE).

Land use planning on the crown land in Northern Ontario operates somewhat differently than on the private land in the south of the province. There are three planning authorities: the MNR, which manages Crown land (most of Northern Ontario consists of Crown land); the MMAH, which defines planning areas and initiates zoning controls in some areas without municipal organization; and planning boards, which coordinate land use planning activities and future growth via official plans and zoning by-laws (MMAH, 2007). The *Public Lands Act* gives the Minister of Natural Resources authority over the management, sale, and disposition of public lands and forests in Northern Ontario. However, as noted by Wilkinson, "*The Public Lands Act* is silent on ecosystem goals for Crown land planning and management, on any process for the allocation of such lands for use, on the need for comprehensive plans or policy statements for such lands, on public participation in regard to Crown land planning or allocation, or on the form of any policies or plans" (Wilkinson, 2002, p. 116). Despite the huge area of land involved (87% of Ontario's total land mass), there have been very few changes to land use planning in the North in the past century. There is no comprehensive land use planning process for the north and the *Public Lands Act*, currently the only tool to guide planning in the north, provides the Ministry of Natural Resources with "remarkably little direction or authority for land use planning" (ECO, 2007, p. 53). The Environmental Commissioner of Ontario (ECO) has repeatedly called for reforms to Ontario's planning system for Crown lands (ECO, 2003; ECO, 2006; ECO, 2007). The Environmental Commissioner of Ontario notes that the law governing planning for Crown land has changed little since its introduction in 1913 and its few provisions for land use plans have never been put into force; and further states,

"Northern Ontario is a region of continental ecological significance and we have a duty to ensure that planning is adequately undertaken. It also is largely composed of Crown land….northern Ontario's unique and varied ecology merits at least the same standard of planning that applies to the rest of the province." (Miller, 2007, p.42).

The following subsections first present a brief history of the evolution of land use planning in Ontario and then present a development of natural heritage policy, with an emphasis, where applicable, on landscape connectivity. As there have been so few changes to planning in Northern Ontario, much of this history focuses on planning within the southern half of the province.

4.1.1 History of Land Use Planning in Ontario

The origins of land use planning in Ontario can be traced to the Province's response to growing interest in urban beautification and growing concern with the impact of industrialization on living conditions and housing (Archives of Ontario 2005). The *City and Suburban Plan Act* of 1912 required municipalities to submit plans of residential and industrial subdivisions to the Ontario Railway and Municipal Board for review and approval. The plans were limited to road access provisions and regulation of the physical proximity of industrial and residential projects. Following a slowdown of urban development during the Depression of the 1930s, increasing urbanization in the 1940s led to the development of a more systematic approach to land use development. The Province created the Department of Planning and Development in 1944 as a tool for planning the long-term development of Ontario's economic and human resources. The year 1944 also saw the passing of the *Planning Act*, revisions to the *Ontario Municipal Board Act,* and the creation of the Community Planning Branch (Archives of Ontario, 2005). In 1946, the passage of the *Conservation Authorities Act* marked a new approach to conservation in Ontario wherein a number of municipal

councils agreed to share responsibility for natural resource management with the Province (Conservation Ontario, 2005). The urbanization and prosperity of 1940s and 1950s, coupled with easier access to undeveloped lands, led to increasing recreational and resource demands on Ontario's remaining natural areas (OMNR, 1978). Environmental groups took interest in expanding Ontario's Provincial Parks system and called for new parks and new management that would allow for new and existing parks to be managed as "true wilderness, free from lodges, cottages, mining, hunting, trapping, railways, and roads" (OMNR, 1978, p. Wi-1-2).

The Province continued to play an active role in creating and implementing urban development policies and land use planning regulations from the 1940s into the early 1980s. Official Plans were used to outline broad guidelines for land use by municipalities and zoning by-laws were used to address specific issues. Local planning boards and committees were created to review proposed developments. Planning became established in most municipalities by the 1960s, following rapid growth and development (Penfold, 1998). Planning interests expanded beyond the urban to reflect concern over the loss of prime agricultural land to suburban development and to reflect society's growing awareness of environmental issues. Ecology was popularized by the mass media and, during the 1960s, an ecological conscience in Ontario broadened to include people beyond naturalists (Warecki, 2000, p. 101). For example, public concern over protecting the Niagara Escarpment, a prominent topographical landform in Southern Ontario, from the negative impacts of aggregate pit and quarry operations, led the Province to commission a number of studies, including the ground-breaking *Niagara Escarpment Study: Conservation and Recreation Report* that was published in 1968 (now commonly known as the Gertler Report) (CONE, 1998). The Gertler Report recommended protecting the Niagara Escarpment through private land use regulation, land acquisition by the Province, restrictions on pits and quarries, and the development

of a parks system (CONE, 1998). In 1970, the Ontario Parliament passed the *Niagara Escarpment Protection Act* and, following further recommendations by the newly appointed Niagara Escarpment Inter-Ministerial Task Force in 1972, the government released a Policy Statement *Development Planning in Ontario-The Niagara Escarpment* and later Parliament passed the *Niagara Escarpment Planning and Development Act* (NEPDA) in 1973 (Whitelaw, 2005; Whitelaw et al., 2008). The purpose of the Act is to maintain the Niagara Escarpment as a continuous natural environment and to ensure compatible development (Government of Ontario, 1973). The Act also created the Niagara Escarpment Commission to oversee decision-making in the development of a land-use plan for the Niagara Escarpment. The Act, the Niagara Escarpment Commission and the Niagara Escarpment Plan (1985) were "significant outcomes" brought about by the activities of environmental organizations (Whitelaw et al., 2008). As noted by Whitelaw et al. (2008), the activities of these Niagara Escarpment environmental organizations from 1960 to 1985 led to a major regime change and provided a model for the next major regime change guided by environmental organizations, based on the Oak Ridges Moraine in the 1990s.

Planning to protect natural heritage was also taking place at the municipal level during the same time period. Starting with the *Conservation Authorities Act* of 1946, municipalities were encouraged to not develop within floodplains or river valleys. As time went by wetlands outside river valleys were given more and more protection. Environmentally Sensitive Areas (ESAs) were developed in Ontario in the early 1970s as part of municipal land use planning (Eagles and Andindu, 1978). ESAs were defined as "any area designated in an official plan, to inform the general public, that the area so named and defined, is recognized as containing a representative ecosystem, whose biological and physical integrity and ecological processes should be maintained, preserved and protected for the present and future inhabitants" or, put more simply,

"our natural heritage" (Eagles and Adindu, 1978). Factors which contributed to the development of ESA planning and management in Ontario during the 1970s included the establishment of regional governments that were open to new concepts and required to prepare official plans; the developing field of environmental management which produced practitioners who combined ecological knowledge with planning skills; political pressure from knowledgeable interest groups (notably the Federation of Ontario Naturalists) and individuals; and a general public in Ontario which "now recognizes environmental issues as being worthwhile…(providing) a fertile bed for political and institutional action in the direction of ESA planning and management" (Eagles, 1980). This increased public awareness of environmental issues in the late 1970s served to encourage municipalities to include natural heritage in their planning (Ainsworth and Kreutzwiser, 1986; Whitelaw et al. 2008).

In 1976, the Region of Waterloo became the first municipality in Ontario, in Canada, and globally to successfully designate ESAs in their Official Plan. Between 1976 and 1980, numerous ESA studies were conducted by Northumberland, Wellington County, Halton Region, Ottawa-Carleton, Credit Valley Conservation Authority, Hamilton-Wentworth and Brant County. By 1981, 18 of 21 regional municipalities and counties had conducted ESA studies and six had ESA policies included in Official Plans approved by the Minister of Housing (Eagles, 1981). Although some felt that ESAs offered inadequate protection (see Estrin, 1980), and there were some notable failures (such as the Ottawa-Carleton's failed ESA attempt in 1974), overall, the designation of natural heritage areas through the municipal land use planning process was described as "one of the major successes of the past decade" (Richards, 1982, p. 58 as cited by Ainsworth and Kreutzwiser, 1986). This ESA effort in Ontario can now be seen as an early attempt to introduce ecological concepts into land use planning.

At the provincial scale, the Province responded to society's growing concerns by commissioning studies and establishing policies for the protection of agricultural land, regulation of mineral aggregates and flood plains in the 1970s. However, questions and criticisms were raised with regards to the complexity, effectiveness and efficiency of Ontario's planning system and discussions began with regard to establishing a formal provincial policy (Penfold, 1998). The Ontario Municipal Board (OMB), in particular, was criticized with regard to its powers to overturn local planning decisions (Archives of Ontario, 2005). A 1971 review of Ontario's planning system by the Ontario Economic Council recommended "a basic policy on the allocation of provincial resources" and "a consistent philosophy on critical policy concerns including particularly environmental conservation, social and economic welfare, and community amenity" (OEC, 1971, p. 97). A 1977 review of the *Planning Act* by the Ontario Planning Act Review Committee (PARC) recommended that provincial interests be legislated to include the maintenance of Ontario's rural and agricultural base, the distribution of economic and social resources, and the distribution of necessary activities with undesirable impacts (Penfold, 1988).

The *Planning Act* and the *Ontario Municipal Board Act* were both significantly amended in 1982, which reduced provincial involvement in the planning process, and divested responsibilities to the local level (Archives of Ontario, 2005). The revised *Planning Act* gave the Ministry of Municipal Affairs the authority to approve official plans which every municipality and planning board "may" develop to "provide guidance of the physical development of the municipality" while "having regard to relevant social, economic and environmental matters" (as cited by Penfold, 1998). The Province formally adopted four provincial policies over the next few years, to which municipalities and other planning authorities were required to *have regard* to when making land use decisions. The Mineral Aggregate Resource Policy (1986), Flood

Plain Planning Policy (1988) and Wetlands Policy (1992) were implemented by the Ministry of Natural Resources, and the Land Use Planning for Housing Policy (1989) was implemented by the (then) Ministry of Housing.

Policy development in the 1980s included a process of review of ministry proposals by the public and various interest groups. This process tended to be very lengthy and contentious, with a long time period between the introduction of policy concepts and granting of final approval. The Province could have shortened the time frame by imposing policy without public input, but the risk of negative public reaction rendered this a politically unacceptable strategy (Penfold, 1998). As such, ministries began adopting guidelines instead of formal policies. This avoided the conflicts and time delays necessitated by the public consultation and review process but ultimately created more conflict when it came time to review official plans and development applications, as these ministry guidelines did not have public or political support. Added to this were charges of corruption at the municipal level and increasing frustration with a planning system that employed "an interminable process with unsatisfactory results" (CPDR, 1993, p.3). A common complaint throughout the province was that the planning process did not adequately protect the natural environment (CPDR, 1993).

The Commission on Planning Development and Reform (CPDR) was commissioned in 1991 and given a broad mandate to "recommend changes to the *Planning Act* and related policy that would restore confidence in the integrity of the planning process, protect public interests, better define roles and relationships, focus more closely on protecting the natural environment, and make the planning process more timely and efficient" (CPDR, 1993, p. 1). The CPDR embarked on an extensive, two-year participatory process to identify reforms that would be publicly acceptable, realistic to implement and which would work within the various municipal and

planning structures of Ontario. Over 40 public forums were held, 15 different working groups were established, and television, radio and print media were used to keep the citizens of Ontario informed and up-to-date on the Commission's progress (CPDR, 1993).

The results of the CPDR process were compiled and presented in *New Planning for Ontario: Final Report* in 1993. Among 98 recommendations was the recommendation that the Province adopt a comprehensive set of policies addressing six key areas of provincial interest, plus policies for implementation. The recommended set of policies was listed in the following order:

A. Natural Heritage and Ecosystem Protection and Restoration Policies

B. Community Development and Infrastructure Policies

C. Housing Policies

D. Agricultural Land Policies

E. Conservation Policies

F. Non-renewable Resource Policies

G. Implementation Polices

The Final Report commented that environmental concerns had been treated as an add-on to the planning process but that recent years had seen "a general acceptance that a pro-active rather than a remedial planning approach is the best way to ensure that the kinds of environmental problems that occurred in the past do not recur in the future" (CPDR, 1993, p. 17). It also recognized the need for provincial direction on environmental issues and it suggested that the Province utilize a sustainable development approach to land use planning that "calls for environmental considerations to be introduced into the front end of decision-making, rather than introduced after environmental degradation has occurred" (CPDR, 1993, p.17). Its natural heritage policy statements recommended that development be prohibited in

significant natural features; and that development not be permitted on adjacent and other lands if it adversely affects the integrity of the features or functions of the areas included in the policy. Importantly, the policies were meant to "go beyond protecting only 'islands of green' and specific natural features as static, isolated entities" and thus they recognized that "natural linkages and corridors are also important to protect from the adverse effects of proposed developments" (CPDR, 1993, p.18).

The recommendations put forward by this report were reviewed by the Ministry of Municipal Affairs, which then released a draft of amended policies for comment by March 1994. The resultant Comprehensive Set of Policy Statements was proclaimed in 1995, as was an amended *Planning Act*. The Comprehensive Set of Policy Statements included the same six policy areas recommended by the CPDR's Final Report and planning decisions were now required, under the *Planning Act*, to "be consistent with" these policies. The natural heritage policies of the Comprehensive Set of Policy Statements are:

> A 1.2 Natural heritage features and areas will be protected.
>
> a) Development will not be permitted in significant ravine, valley, river and stream corridors, and in significant portions of the habitat of endangered species and threatened species.
>
> Development will not be permitted on adjacent lands if it negatively impacts the natural features or the ecological functions for which the area is identified.
>
> b) Except for the areas covered in a), significant portions of the habitat of vulnerable species, significant natural corridors, significant woodlands south and east of the Canadian Shield, areas of scientific and natural interest, shorelines of lakes, rivers and streams, and significant wildlife habitat will be classified into areas where either:
> 1) no development is permitted; or
> 2) development may be permitted only if it does not negatively impact the natural features or the ecological functions for which the area is identified.
>
> Development will not be permitted on adjacent lands to 1) and 2) if it negatively impact the natural features or the ecological functions for which the area is identified.

In addition, Provincial Policy A1.4 states,

> In decisions regarding development, every reasonable opportunity should be taken to: maintain the quality of air, land, water and biota; maintain biodiversity compatible with indigenous natural systems; and protect natural links and corridors. The improvement and enhancement of these features and systems is encouraged.

This means that the early work by individual municipalities on incorporating ecological concerns into municipal planning through the designation of Environmentally Sensitive Areas in the 1970s had been broadened and fully incorporated into provincial law and policy in Ontario by 1995. The ESA selection criteria of the 1970s had mentioned the linkage function as one element to be used in designation, but this did not include the selection of lands between ESAs as corridors or linkages.

The Comprehensive Set of Policy Statements also included a detailed definition of corridors:

> Corridors: Means, for the purposes of the policies in Goal A1 and the related definitions, the naturally vegetated or potentially revegetated areas that link or border natural areas and provide ecological functions such as habitat, passage, hydrological flow, connection or buffering from adjacent impacts. They can occur across or along uplands, lowlands or slopes. Ravine, valley, river and stream corridors are further defined as landform depressions, usually with water flowing through or standing in them for some period of the year. Ravine and valley corridors may be defined locally by considerations such as their natural features or functions, minimum setbacks from the crest of slope, top of ravine or valley bank or top of projected stable slopes (MMAH, 1994, p. 27).

The Comprehensive Set of Policy Statements was accompanied by the Comprehensive Policy Statements Implementation Guidelines, a detailed volume that provided over 700 pages of background information, interpretation of policies and suggestions for policy implementation. Regarding implementation of natural heritage policies, it states that,

> Municipal planning can be viewed as one of the most important decision-making processes in Ontario in terms of protecting natural heritage, because it exercises a major control over future land uses. Planning documents consistent with this policy statement can enhance the natural values of the landscapes in Ontario, and help achieve the goal of protecting the quality and integrity of ecosystems (MMA, 1995, p. A34).

The Implementation Guidelines includes a detailed section (see 2.2.7 , p. 31) on significant natural corridors which explained the ecological benefits of corridors, the importance of planning for corridors in Ontario, how to evaluate corridors, and the planning implications of the significant natural corridor policy. This section provides municipal planners with clear direction and detailed information on planning for connectivity.

Unfortunately, a change in provincial government in 1995 led to the early demise of the policy statement and its progressive natural heritage policies. The socialist New Democratic Party, under which these important planning reforms had been made, was replaced by the more business-friendly Progressive Conservative party. The Conservatives, backed by a strong development lobby, perceived environmental protection to be a threat to economic concerns and so, quickly and without public consultation, introduced a revised *Planning Act* and a much-revised Provincial Policy Statement in 1996. As stated by the Minister responsible for the release of the new act, "The whole planning and development process was wrapped in a sea of red tape and the legislation and policies tilted in favour of environmental concerns—to the detriment of Ontario's economic health" (Wright, 1995, p. A2).

The revised Planning Act returned to the "have regard to" operating clause for the policies in the Provincial Policy Statement, which many perceived to be a weaker test than "shall be consistent with" and thus a lower policy implementation standard. The policies in the PPS were also significantly altered, such that they became less restrictive and provided less protection for natural heritage, as will be shown below.

Section 2.3 of the PPS 1996 (amended 1997) concerned Natural Heritage. Policy 2.3.1 stated that natural heritage features and areas will be protected from incompatible development. The PPS identified seven natural heritage features that were to be protected: significant wetlands, fish habitat, significant woodlands south and east of the Canadian Shield, significant valley lands south and east of the Canadian Shield, significant portions of the habitat of endangered and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest (see Table 4.1). The PPS did not permit development and site alteration in significant wetlands south and east of the Canadian Shield or in significant portions of the habitat of endangered and threatened species. Development and site alteration was permitted in fish habitat, significant wetlands in the Canadian Shield, significant woodlands south and east of the Canadian Shield, significant valley lands south and east of the Canadian Shield, significant wildlife habitat, and significant areas of natural and scientific interest; if it had been demonstrated that there would be no negative impacts on the natural features or the ecological functions for which the area was identified. Development and site alteration was permitted on adjacent lands to significant features if it had been demonstrated that there would be no negative impacts on the natural features or on the ecological functions for which the area was identified. Infrastructure was not included in the definition of development. Agricultural uses were permitted to continue in all areas.

The Conservative Government's PPS was not as prescriptive as the Comprehensive Set of Policy Statements and put forward considerably weakened natural heritage policies. Although "significant natural corridors" were no longer recognized as one of the natural heritage features to be protected, as they were in the Comprehensive Set of Policy Documents, the concept of landscape connectivity was retained in the revised PPS. Section 2.3.3 states, "The diversity of natural features in an

area, and the natural connections between them should be maintained, and improved where possible." This wording of "natural connections between them" is important, as it suggests that the concept of landscape connectivity was sufficiently well accepted in Ontario and thus able to withstand a significant change in political power between parties with very different views about land use planning.[2]

Section 3 of the *Planning Act* requires that a review of the PPS be commenced at least one every five years from the date a PPS is enacted. A Five-Year Review of the PPS was initiated in 2001. During the stakeholder consultation process, environmental protection was identified as a key priority in land use planning,

> Stakeholders said environmental protection is a key priority in land use planning and a critical determinant of quality of life. Common themes were that the Provincial Policy Statement should have a stronger environmental focus, address cumulative impact, and ensure that the environment is a key consideration when balancing provincial interests. Some advocated adopting an "environment-first" approach.
>
> Stakeholders identified several key subcomponents of the environment and natural heritage as being important, including water and air, wetlands and woodlands, and the protection of species and habitat. Linkages between the various components of the environment were also identified as a key issue. (MMAH, 2002, p. 5)

Despite these stakeholder concerns, no changes were made to the PPS as a result of this review.

In 2003, the Conservative Government was replaced by the new Liberal Government headed by Dalton McGuinty. This government proposed amendments to the Planning Act, which were passed by Parliament in 2004. In addition, a new PPS was created in 2005, coinciding with the effective date of Section 2 of the *Strong Communities (Planning Amendment) Act, 2004*, which was brought in by the Liberals and requires that planning decisions on applications that are subject to the new PPS

[2] However, the author of this section of the PPS suggests that he slipped in this wording without his political masters being fully aware (Eagles, 2008).

"shall be consistent with" the new policies (MMAH, 2007). The policies of the new PPS are intended to "fulfill the government's commitment to provide strong, clear policy direction on land use planning to promote strong communities, a clean and healthy environment, and a strong economy." (MMAH, 2007).

Section 2.1 of the PPS 2005 concerns Natural Heritage. Policy 2.1.1 states that natural features and areas shall be protected for the long term. The PPS 2005 identifies eight natural heritage features that are to be protected: significant wetlands, significant coastal wetlands, fish habitat, significant woodlands south and east of the Canadian Shield, significant valleylands south and east of the Canadian Shield, significant portions of the habitat of endangered and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest (see Table 4.1).

Table 4.1 Comparison of 1996 and 2005 Provincial Policy Statements

Provincial Policy Statement 1996	Provincial Policy Statement 2005
Landscape Connectivity:	
"The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible."	"The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.
Natural Heritage Features and Areas Protected from Incompatible Development:	
Significant wetlands	Significant wetlands
	Significant coastal wetlands
Fish habitat	Fish habitat
Significant woodlands south and east of the Canadian Shield	Significant woodlands south and east of the Canadian Shield
Significant valleylands south and east of the Canadian Shield	Significant valleylands south and east of the Canadian Shield
Significant portions of the habitat of endangered and threatened species	Significant portions of the habitat of endangered and threatened species
Significant wildlife habitat	Significant wildlife habitat
Significant areas of natural and scientific interest	Significant areas of natural and scientific interest
Development and Site Alteration not Permitted in:	
Significant wetlands south and east of the Canadian Shield	Significant wetlands in Ecoregions 5E, 6E and 7E
Significant portions of the habitat of endangered and threatened species	Significant portions of the habitat of endangered and threatened species
	Fish habitat
	Significant coastal wetlands
Development and Site Alteration Permitted if it has been demonstrated there will be no negative impacts on the natural features or their ecological functions:	
Fish habitat	
Significant wetlands in the Canadian Shield	Significant wetlands in the Canadian Shield in Ecoregions 5E, 6E and 7E
Significant woodlands south and east of the Canadian Shield	Significant woodlands south and east of the Canadian Shield
Significant valleylands south and east of the Canadian Shield	Significant valleylands south and east of the Canadian Shield
Significant wildlife habitat	Significant wildlife habitat
Significant areas of natural and scientific interest	Significant areas of natural and scientific interest
Agricultural Uses Permitted in:	
Agricultural uses permitted to continue in all areas	Existing agricultural uses permitted to continue in all areas
Development and Site Alteration Permitted on Adjacent Lands if it has been demonstrated there will be no negative impacts on the natural features or their ecological functions	
Infrastructure Not Included in Definition of Development	

The PPS 2005 does not permit development and site alteration in significant habitat of endangered species and threatened species; significant wetlands in Ecoregions 5E, 6E and 7E; fish habitat (except in accordance with provincial and federal requirements) and significant coastal wetlands. Development and site alteration is not permitted in significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E; significant woodlands south and east of the Canadian Shield; significant valleylands south and east of the Canadian Shield; significant wildlife habitat; and significant areas of natural and scientific interest, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. Development and site alteration is not permitted on adjacent lands to the natural heritage features and areas, unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions. Infrastructure is not included in the definition of development. Existing agricultural uses are permitted to continue in all areas.

Again, the concept of landscape connectivity was retained in the PPS 2005, and it was expanded upon. Section 2.1.2 states,

> The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

Section 2.1.2 considerably strengthens the concept of linkages with the phrase: "recognizing linkages between and among natural heritage features and areas, surface water features and ground water features" which is more expansive than the previous phrase: "natural connections between them."

This section has provided a brief history of land use planning in Ontario, with an emphasis on natural heritage and landscape connectivity. The following section will

take a closer look at the development of specific natural heritage policy in Ontario, again with an emphasis on landscape connectivity.

4.3 Development of Natural Heritage Policy in Ontario

This section presents a series of milestones in the development of the Government of Ontario's natural heritage policy. These important Acts, policies, programs, projects and documents are based on the results of the literature search and on a table from *Nature's Best - Ontario Parks & Protected Areas: The Framework & Action Plan*, which traces the "evolving concern for natural heritage values by the people of Ontario" (OMNR, 1997, p.ii).

Milestones in the Development of the Government of Ontario's Natural Heritage Policy

1893

Protection of natural heritage areas in Ontario commenced with the establishment of **Algonquin Provincial Park**. For the next 50 years, provincial policy evolved gradually through the periodic addition of new parks.

1946

The passage of the ***Conservation Authorities Act*** recognized the benefits of resource management on a watershed basis. Conservation Authorities started to become established across rural southern Ontario, and over time took on a broader natural heritage protection role, particularly on acquired lands.

1954

The creation of a comprehensive ***Provincial Parks Ac*t** established the provincial parks system as the premier vehicle for protecting areas on a province-wide basis.

1959

The addition of the ***Wilderness Areas Act*** recognized the need for legislation to protect natural areas, and provided for preservation of areas in their natural state.

1968

The publication of the ***Niagara Escarpment Study: Conservation and Recreation Report***, written by Mr. Len Gertler, occurred in 1968. This ground-breaking report recommended protecting the Niagara Escarpment area through land use regulation on private lands, land acquisition by the Province,

restrictions on pits and quarries, and the further development of a parks system.

1970

The passage of the ***Niagara Escarpment Protection Act*** followed from the Gertler report and restricted mineral resource extraction near the Escarpment.

The publication of the document entitled: ***Developing a Better Environment: Ecological Land Use Planning in Ontario: A Study of Methodology in the Development of Regional Plans*** (Hills et al). advanced the use of ecological land use planning in Ontario.

1971

The creation of Ontario's first ***Endangered Species Act*** addressed a growing concern for endangered species and their habitats.

1973

The passage of the ***Niagara Escarpment Planning and Development Act*** put in place a whole new framework for escarpment planning and conservation. The purpose of this Act is to provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment.

1976

The passage of the ***Ontario Environmental Assessment Act*** *f*orced environmental planning into all aspects of provincial government activities.**.** The purpose of this Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment.

The passage of the ***Ontario Environmental Protection Act***. provided for the protection and conservation of the natural environment.

The Region of Waterloo became the first municipality in the world to successfully designate **Environmentally Sensitive Areas** (ESAs) in their Official Plan.

1978

The publication of ***A Manual for ESA Planning and Management in Ontario*** (Eagles and Adindu) provided details to planner for the identification and designation of ESA is Official Plans. This field manual described the emerging phenomenon of Environmentally Sensitive Area planning and helped popularize the concept throughout Ontario and elsewhere in Canada.

A new **Provincial Parks Policy** identified four objectives for the parks system, including one of protection.

1983

A creation of an **Areas of Natural and Scientific Interest** (ANSI) policy, based on province-wide land use planning, supported the identification of natural heritage areas outside provincial parks on other public and private lands.

The creation of 155 new provincial parks was started

1985

The first comprehensive **Niagara Escarpment Plan** was approved (revised in 1994 and 2005). The purpose of this Plan was to provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment.

1988

The passage of the ***Conservation Land Act*** encouraged private landowners to protect natural values by providing property tax rebates.

1990

The ***Royal Commission on the Future of the Toronto Waterfront-Watershed (Interim report***) recommended an ecosystem approach to planning a greenway system for the Greater Toronto Bioregion.

1991

The OMNR released ***A Natural Heritage Framework: A Strategy for the Protection and Management of Natural Heritage in the Greater Toronto Area*** (OMNR). This document laid out a conceptual framework of natural cores, natural corridors and connecting links within a human-dominated matrix, based on conservation biology principles.

1992

The **Ontario Wetlands Policy Statement** was established.

The OMNR released ***A Natural Heritage Areas Strategy for Ontario, Responding to the Endangered Spaces Challenge*** (draft OMNR). This draft document, in response to a "growing concern for the natural environment" in Ontario, presents a strategy that maximizes efforts to protect natural areas and recommends that the MNR and others prepare a comprehensive policy statement for Ontario's natural heritage areas (OMNR 1992).

The ***Royal Commission on the Future of the Toronto Waterfront-Regeneration (Final Report*)** proposed an interregional greenway system, based on watersheds, which would link parks, significant natural habitats, marinas, wetlands, woodlands, ESAs and ANSIs (Erickson 2006).

1993

Parliament passed the ***Environmental Bill of Rights***. This Act recognizes that the provincial government has the primary responsibility for protecting, conserving and restoring the natural environment. It also recognizes that the people of Ontario have the right to participate in government decisions about the environment and the right to hold the government accountable for those

decisions (ECO 2003).

A consultant firm released a document entitled: ***Natural Heritage Systems for the Oak Ridges Moraine Area***: *Greater Toronto Area Portion* (Geomatics). This document presented the "first expression of cores and corridors concepts, based on conservation biology, for use in Canada in a major land use planning effort" (Whitelaw and Eagles 2007, p.679).

A Planning Commission released: ***New Planning for Ontario***: ***Final Report.*** This report was the culmination of the work done by the Commission on Planning Development and Reform (CPDR) and it recommended that the Province adopt a comprehensive set of policies addressing six key areas of provincial interest, plus policies for implementation, which included Natural Heritage and Ecosystem Protection and Restoration Policies.

1994

The OMNR released ***The Natural Heritage of Southern Ontario's Settled Landscapes*** (Riley and Mohr for OMNR). This was a comprehensive review of conservation and restoration ecology for land use and landscape planning.

1995

The Provincial Government, under the Planning Act, created the ***Comprehensive Set of Policy Statements***. The Comprehensive Set of Policy Statements included the same six policy areas recommended by the CPDR's Final Report and planning decisions were now required, under the *Planning Act*, to "be consistent with" these policies. Corridors were included in the list of natural heritage features and areas to be protected.

The **Lake Ontario Greenway Strategy (Waterfront Regeneration Trust)** was published**.** This strategy built on the previous work of the Royal Commission on the Future of the Toronto Waterfront. The goal of the strategy is "to foster commitment to actions that will regenerate a healthy and sustainable waterfront that is clean, green, accessible, connected, open, usable, diverse, affordable and attractive".

A Natural Heritage Strategy for the Lake Ontario Greenway (Waterfront Regeneration Trust) was published**.** The goal of the NHS is "to ensure an adequate supply of habitats to restore and sustain in the long term the full range of biodiversity along the waterfront".

1996

A revised **Provincial Policy Statement** was released and further amended in 1997. The Conservative Government's PPS put forward considerably weakened natural heritage policies, but the concept of landscape connectivity was retained.

The Ontario government endorsed the **Canadian Policy on the Conservation of Biodiversity** (signed by Canada at the United Nations Earth Summit in 1992).

The **Managed Forest Tax Rebate Program** was reinstated to provide property tax rebates to owners of forested land who maintain healthy woodland ecosystems. This provides an additional tool to encourage protection on private lands.

1997

The **Lands for Life Land Use Planning Process** (OMNR) was started. This was an extensive regional land use planning exercise carried out by the Government of Ontario between February 1997 and May 1999. The process was initiated in order to complete Ontario's provincial system of parks and protected areas.

The OMNR released the document: ***Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan*** (OMNR). The OMNR describes Nature's Best as "our action plan to preserve our wilderness, landscapes and natural features for future generations. It is our commitment to complete a system of parks and protected areas which will represent the full range of the province's natural and cultural features". Nature's Best is one of three initiatives launched under the Lands for Life Planning Process.

1999

The OMNR released the document: ***Ontario Living Legacy Land Use Strategy*** (OMNR). This strategy is the end product of the Lands for Life Planning Process. It sets a framework for future land and resource management on 39 million hectares of Crown lands and waters in a planning area covering 45 percent of the province.

The OMNR released the document: ***Natural Heritage Reference Manual*** (OMNR). A comprehensive guide for planners and others who require additional information on technical issues relative to the application of Section 2.3- Natural Heritage of the Provincial Policy Statement. It provides guidance on how to implement the natural heritage policies.

2000

The OMNR released the document: ***A Natural Heritage System for the Oak Ridges Moraine: Cores and Conceptual Linkages GTA Portion*** (OMNR).

A consortium of groups released the **Big Picture Project 2000** (OMNR-NHIC, Carolinian Canada, and Nature Conservancy of Canada). This project identifies a natural heritage system in Carolinian Canada of large core natural areas, other significant natural areas and corridors and linkages. It is intended to complement other analyses of natural heritage conducted by municipalities, conservation authorities, provincial and federal departments.

The OMNR released the document: **Significant Wildlife Habitat Technical Guide** (OMNR). A technical manual to assist planning authorities and other participants in the municipal planning system by providing detailed information on the identification, description and prioritization of significant wildlife habitat. This guide is advisory and is intended for use in the municipal policy and development process under the Planning Act.

2001

The Parliament of Ontario passed the ***Oak Ridges Moraine Conservation Act***. This Act authorizes the Government of Ontario to provide for the protection of the Oak Ridges Moraine Area through the implementation of the Oak Ridges Moraine Conservation Plan.

2002

The government of Ontario released **Oak Ridges Moraine Conservation Plan**. This is "an ecologically based plan established by the Ontario government to provide land use and resource management direction for the 190,000 hectares of land and water within the Moraine" (MMAH 2002).

A consortium of groups released the **Big Picture 2002** (OMNR-NHIC, Carolinian Canada, Nature Conservancy of Canada, and Ontario Nature). The purposes of this project are:

1. To assemble and interpret the best available, digitally mapped data on the biological diversity of southern Ontario,
2. To identify high-value core natural areas and highest-probability linkages, and adjacent areas of existing natural vegetation, and
3. To generate replicable, rule-based mapping of a landscape-scale natural heritage system for southern Ontario (McMurtry et al 2002).

2004

The Parliament of Ontario passed the ***Crown Forest Sustainability Act***. This Act guides all forest management on public lands in Ontario. It requires that the OMNR ensure that forests management sustains environmental, economic and social values.

2005

The Government of Ontario created a new **Provincial Policy Statement** under the Planning Act**.** The new PPS requires that planning decisions on applications that are subject to the new PPS "shall be consistent with" the new policies. Natural features and areas "shall be protected for the long term".

The Parliament of Ontario passed the ***Greenbelt Act***. This Act enables the creation of a Greenbelt Plan to protect about 1.8 million acres of environmentally sensitive and agricultural land in the Golden Horseshoe from urban development and sprawl. It includes and builds on about 800,000 acres of land within the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan.

The Government of Ontario created **the Greenbelt Plan**. This plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring on this landscape. The Greenbelt Plan includes lands within, and builds upon the ecological protections provided by, the Niagara Escarpment Plan (NEP) and the Oak Ridges Moraine Conservation Plan (ORMCP). It also complements and supports other provincial level initiatives such as the

Parkway Belt West Plan and the Rouge North Management Plan. (MMAH 2005).

The OMNR released the document: **Ontario Biodiversity Strategy** (OMNR). This strategy "sets out a plan in which all Ontarians, communities and sectors of society can and must play an important role. Its vision is about sharing responsibility for conserving Ontario's biodiversity" (OMNR, 2005, p.5).

The OMNR released the document: **Natural Spaces Program** (OMNR). Its mandate is to establish a framework and mechanisms for conservation and restoration of healthy ecosystems in southern Ontario (see Figure 4.1) through the voluntary and cooperative efforts of landowners, conservation organizations and governments (OMNR, 2005).

The Parliament of Ontario passed the ***Places to Grow Act***. This Act is intended to help the Ontario government plan for growth in a "strategic and coordinated way" that "balances the needs of the economy with the environment" (Government of Ontario, 2007).

A consortium of groups released the **Great Lakes Conservation Blueprint** (OMNR-NHIC and The Nature Conservancy of Canada). The goal of the Great Lakes Conservation Blueprint is to identify a network of sites on the landscape that, if conserved, could sustain biodiversity in the Great Lakes region.

2006

The Government of Ontario created the **Places to Grow: Growth Plan for the Greater Golden Horseshoe.** This plan, prepared under the *Places to Grow Act*, is a framework for implementing the Government of Ontario's vision of building stronger, prosperous communities by better managing growth in this region to 2031 (Ministry of Public Infrastructure Renewal, 2006).

The Parliament of Ontario passed the ***Provincial Parks and Conservation Reserves Act, 2006***. The purpose of this Act is to permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions, protects provincially significant elements of Ontario's natural and cultural heritage, maintains biodiversity and provides opportunities for compatible, ecologically sustainable recreation.

2007

The Parliament of Ontario passed the ***Endangered Species Act.*** The purposes of this Act are: To identify species at risk based on the best available scientific information, including information obtained from community knowledge and aboriginal traditional knowledge; to protect species that are at risk and their habitats, and to promote the recovery of species that are at risk; and, to promote stewardship activities to assist in the protection and recovery of species that are at risk.

The next section of the thesis discusses the relevance of the creation of these policies, documents, plans and laws for the concept of landscape linkage planning in Ontario.

4.4 Planning for Landscape Connectivity in Ontario Government Legislation and Policy: Movement from Theory to Practice Between 1970 and 2008

This section 4.4 presents milestones from the above list that are significant to planning for landscape connectivity. Each is briefly described, in sequence, in order to outline the movement of theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008. Detailed analyses of these documents will be presented in Chapters 5 and 7.

Period 1970-1979

The Niagara Escarpment is Southern Ontario's most prominent landscape feature and is defined by a largely-forested corridor, 725 km in length, which passes through Canada's most heavily-developed region (NEC, 2004). It is a provincially and internationally significant geological landform (NEC, 2004; Whitelaw, 2005). Calls to protect the Escarpment from development pressures began in the 1960s with the opening of the Bruce Trail in 1967. These calls led initially to the passing of the *Niagara Escarpment Protection Act* in 1970, which restricted mineral resource extraction near the Escarpment (Plaunt, 1978; NEC, 2004). The Government of Ontario established a task force on the Niagara Escarpment in 1972, which recommended establishing a Provincial planning system featuring public ownership and strong land use regulation (NEC 1973; Whitelaw, 2005). The *Niagara Escarpment Planning and Development Act* was passed in 1973 and has as its purpose, "to provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a

continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment" (Government of Ontario, 1973). Both Acts are important to planning for landscape connectivity in Ontario as they mark the first time that the concept of a "continuous natural environment" received protection through legislation in the province. The *Niagara Escarpment Planning and Development Act* allowed for direct provincial planning and was more oriented to environmental protection than the *Planning Act,* which is geared towards accommodating development.

Also important in the 1970s was the development of planning for Environmentally Significant Areas (ESAs). As noted in Chapter Two, the development of ESAs was the first attempt at moving from ecology theory to land use planning practice in municipalities in Ontario. Although ESAs later came to be criticized for being "islands of green" (Dougan, 1984; Diamond et al., 2002), early criteria for ESA designation did, in fact, include the concept of landscape connectivity. Eagles and Adindu (1978, p. 46) listed nine criteria for selecting ESAs for designation in Regional Official Plans, the second of which was:

> The ecological function of the area is vital to the healthy maintenance of a natural system beyond its boundaries, such as serving as a major water storage or recharge area, important wildlife migratory stopover or concentration point, or a linkage of suitable habitat between natural biological communities.

However, the importance of connectivity was not yet fully emphasized or recognized in Ontario's land use planning at that point in time.

During the 1970s, conservation biology concepts were still evolving. For example, Eagles and Adindu (1978, pp. 32-33) wrote that "ecology could be directly concerned with land use development planning" and could be used to prevent "undesirable adjustment of the system in pattern and process". They then continued, "To maintain a steady state and diversity, and harvest economically without invoking

ecodisaster, all management programmes should evaluate and analyze the cost-benefit of disturbance and eschew all actions that will result in undesirable sudden and violent changes". These statements reflect the best available scientific knowledge of that time. The importance of the dynamic nature of ecosystems was beginning to receive recognition in Ontario. As discussed in Chapter Two, the emergence of the dynamic non-equilibrium paradigm had a strong impact on planning for conservation, taking us from a reactive approach (protecting static areas) to a proactive approach (anticipating and planning for flux). At the time of the first ESAs, this paradigm shift had not yet fully occurred and although connectivity was mentioned, the true importance of maintaining linked systems of habitat large enough to allow for flux and disturbance was not yet widely recognized in Ontario's land use planning efforts.

Period 1980-1989

Notable in the 1980s is the creation of the Niagara Escarpment Plan, Canada's first large-scale, environmental land use plan. The NEP was developed by the Niagara Escarpment Commission, a seventeen-member commission with nine public representatives and eight members representing the upper tier municipalities associated with the Niagara Escarpment (Whitelaw, 2005). The NEP has seven land use designations, criteria for mapping the designations, and permitted uses for each (Whitelaw, 2005). The NEP established a separate provincial agency and planning system and it features strong development controls that would likely not be feasible today (Erickson, 2006). Although the first NEP in 1985 (later revised in 1994 and 2005) does not directly discuss the concept of landscape connectivity, it is important to planning for landscape connectivity because it was the means by which the *Niagara Escarpment Planning and Development Act,* and thus the concept of a "continuous natural environment", was implemented. The NEP includes a description of the 105

parks within the Niagara Escarpment Parks System, many of which are linked by the Bruce Trail. The Niagara Escarpment was the focus of international attention and, in February 1990, the Niagara Escarpment was designated a World Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (UNESCO) (NEC, 2004).

Period 1990-1999

Prior to the 1990s in Canada, the concept of ecosystem planning was little known outside of academia (Erickson, 2006). In a plenary lecture given at a 1990 meeting of the US-IALE, it was noted that "We know from the land use planning of Angus Hill in Canada and Ian McHarg in the United States that art and ecology can be combined in ways that serve the continuing public interest; but we have not mobilized the political will to make an ecological approach to land use management conventional" (Caldwell, 1990, p. 6). A number of important policy initiatives in the 1990s advanced the ecosystem approach to planning, based on conservation biology principles, to Ontario specifically and, on a larger scale, to Canada. This "new" ecosystem approach brought the concept of landscape connectivity to the attention of planners, policy makers and the general public.

The 1990 publication of the Royal Commission on the Future of Toronto's Waterfront interim report, *Watershed*, is described as marking a new stage in the history of ecosystem planning in Canada (Erickson, 2006; Tomalty et al., 1994). This report introduced the ecosystem approach to planning to a wider audience. It listed nine principles that should form the basis of all policies and planning for the waterfront in the Greater Toronto Bioregion by government at all levels: essentially, the waterfront should be clean, green, useable, diverse, open, accessible, connected, affordable, and attractive (Royal Commission on the Future of Toronto's Waterfront, 1990). The

"connected" principle is significant to planning for landscape connectivity in Ontario as it recognizes the importance of maintaining and restoring ecological (and recreational) connections via waterfront planning. The report states, "Major green corridors should connect the waterfront, valley systems and Oak Ridges Moraine" and also recommends, "local initiatives to create or maintain natural corridors in other areas should be fully supported" (Royal Commission on the Future of Toronto's Waterfront 1990, p. 72). The report recommended updating regulations to reflect current ecological values. It also acknowledged the need for public support and direct involvement from provincial and municipal levels of government if the goal of creating a continuous waterfront trail, across multiple jurisdictions, was to be successful.

The *Watershed* report was followed by *Regeneration: Toronto's Waterfront and the Sustainable City, Final Report* in 1992. This report proposed an interregional greenway system for the Greater Toronto Bioregion, based on watersheds, with a waterfront trail that would connect parks, marinas, significant natural habitats, wetlands, woodlots, ESAs, and ANSIs. In a study of four Canadian greenway projects, Taylor et al. (1995) described the Regeneration plan as most ambitious because it progressed from an urban design approach to ecologically-based planning. Also in 1992, the Royal Commission on the Future of Toronto's Waterfront was replaced by the Waterfront Regeneration Trust (WRT). The WRT was established to implement the findings of the Commission (Erickson, 2006). In 1995, the WRT published the *Lake Ontario Greenway Strategy* and *A Natural Heritage Strategy for the Lake Ontario Greenway*. These documents built upon the earlier work of the Royal Commission and are important to planning for landscape connectivity in Ontario as they further emphasize both the need to restore and maintain habitat corridors and other "landscape connections" throughout the bioregion and the need to recognize the ecological value of connectivity within municipal and provincial planning documents (WRT, 1995a).

For example, Action 1.3: *Protect bioregional habitat corridors and connections* of the *Lake Ontario Greenway Strategy,* states:

> The critical importance of bioregional habitat corridors connecting to the Greenway should be fully recognized through municipal planning documents and any future Provincial greenlands initiatives…As well, the importance of habitat connections within the Oak Ridges Moraine should be fully recognized in provincial policies for that landscape feature.
>
> The ecological values, particularly habitat linkage values, of the valley and forest corridors identified within and adjacent to the Greenway should be recognized and protected in future planning documents and in watershed plans. Where they occur, east-west habitat corridors should be protected and strengthened…(WRT, 1995a, p.81).

Two MNR documents published in the early 1990s also proved to be influential to planning for landscape connectivity in Ontario. *A Natural Heritage Framework: A Strategy for the Protection and Management of Natural Heritage in the Greater Toronto Area* (OMNR, 1991) laid out a conceptual framework of natural cores, natural corridors and connecting links within a human-dominated matrix, based on conservation biology principles. This strategy is significant to planning for landscape connectivity in Ontario because, along with serving as a conceptual framework for natural heritage systems in general, it is credited with bringing the conservation biology concepts of cores, corridors and connecting links into the Oak Ridges Moraine (ORM) land use planning process, via consultant planners who used it to guide their work on natural heritage delineation (Whitelaw and Eagles, 2007). The ORM planning process will be discussed later in this section. The work of these planners is presented in *Natural Heritage Systems for the Oak Ridges Moraine Area*: *Greater Toronto Area Portion* (Geomatics, 2003), which formed the basis of the natural heritage system proposed by the Oak Ridges Moraine Technical Working Committee. This document is significant to planning for landscape connectivity in Ontario as it is the "first expression of cores and corridors concepts, based on

conservation biology, for use in Canada in a major land use planning effort" (Whitelaw and Eagles, 2007, p. 679).

The Lands for Life (L4L) land use planning process was an extensive regional land use planning exercise carried out by the Government of Ontario between February 1997 and May 1999. The process was initiated in order to complete Ontario's provincial system of parks and protected areas and to provide certainty about land use allocations to logging, mining and tourism industries (the further objective of enhancing sport fishing and hunting was added later) (Appleby et al. 2004, National Round Table on the Environment and the Economy (NRTEE) 2003, OMNR 1999). Initiatives launched under the L4L process included the *Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan,* the Resource-Based Tourism Policy and the Ontario Forest Accord.

The OMNR describes *Nature's Best* as "our action plan to preserve our wilderness, landscapes and natural features for future generations. It is our commitment to complete a system of parks and protected areas which will represent the full range of the province's natural and cultural features" (OMNR, 1997). The purpose of the Resource-based Tourism Policy is "to promote and encourage the development of the Ontario resource-based tourism industry in both an ecologically and economically sound manner" (OMNR, 1997). The Ontario Forest Accord was the outcome of intense, "closed-door" negotiations between the forest industry, the OMNR and the Partnership for Public Lands, a coalition of environmental organizations (Appleby et al., 2004; NRTEE, 2003). The two fundamental tenets of the Accord were: 1) Protected areas would be established to cover 12% of the planning area, as well as to cover any gaps in ecological representation as need; and 2) park establishment would not lead to any increase in the cost of wood delivered to mills or to a long-term reduction in fiber supply (NRTEE, 2003). The end product of the L4L planning process was *Ontario's*

Living Legacy Land Use Strategy, a guidance document based largely on the Ontario Forest Accord that set a framework for future land and resource management on Crown lands in the planning area (OMNR, 1999).

The L4L process is significant to landscape connectivity as its planning area encompasses almost half of the province and, therefore, its approach to connectivity may have a province-wide impact. The L4L documents (including *Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan, Ontario's Living Legacy Land Use Strategy*, the Ontario Forest Accord and the Resource-Base Tourism Policy) will be analyzed in Chapter 5. The L4L planning process itself will be analyzed further in Chapter 7

Period 2000-2008

Up to 2000, the protection of cores, through the designation of ESAs and ANSIs, in municipal official plans was well accepted in Ontario and the protection of local corridors was emerging as a planning tool but "sporadically undertaken" (Whitelaw, 2005, p. 130). Between 2000 and 2008, important policies, legislation and programs both popularized and legitimized the concept of landscape connectivity. Also of note during this period is the emergence of the emerald ash borer, a highly destructive invasive alien species (native to eastern Asia), whose discovery in Windsor in 2002 sparked quarantines, movement restrictions, strict regulations and massive tree cutting in a failed attempt to stop the spread of this species throughout Ontario. The emerald ash borer has killed millions of ash trees in Southwestern Ontario, Michigan and other surrounding states and poses a major economic and environmental threat to forested areas in both Canada and the United States (Canadian Food Inspection Agency, 2008). Despite concerted efforts to disrupt the spread of this species by breaking forest linkages and preventing people from moving infested wood to new

areas, the emerald ash borer has continued to invade Ontario and is now found in Bluewater, Pickering, Sault Ste. Marie, Vaughan, Ottawa, Mississauga, Brampton, Oakville and the Monteregie region of Quebec (Canadian Food Inspection Agency, 2008). This invasion provides an important reminder that landscape connectivity can be negative in some circumstances.

The Oak Ridges Moraine is one of the few remaining large greenspace corridors in southern Ontario, covering 190,000 hectares, and it is one of the most important landscapes for providing connected open space for the Greater Toronto Area (Erickson, 2006). It is also an ecologically sensitive geological landform in a heavily populated area of the province and has been the subject of an intense land use battle between developers, private citizens, environmental groups and the Government of Ontario. This lengthy conflict led to the passing of the *Oak Ridges Moraine Conservation Act* in 2001 and the Oak Ridges Moraine Conservation Plan (ORMCP) in 2002.

According to Hanna and Webber (2005), the ORMCP represents a dramatic change in the Government of Ontario's approach to the ORM and to planning, in general, in Ontario as the ORMCP uses ecological principles to define land use designations. The Oak Ridges Moraine planning process is significant to planning for landscape connectivity as it represents the first time in Canada, and possibly internationally, that "a natural-heritage system that includes designation of long, wide conservation corridors on private lands based on conservation biology has been significantly regulated through land use planning legislation" (Whitelaw and Eagles, 2007, p. 681). The designation of private land for conservation on the basis of regional corridors as occurred in the ORM was new (Eagles and Whitelaw, 2004). At a Greenways conference in 2007, Reed Noss used the Oak Ridges Moraine as an example of how a concept (using cores, corridors and buffers) that was, earlier in his

career, considered radical, but that is now being planned for and widely accepted. The *ORM Act* and Plan will be analyzed in Chapter 5 and the ORM planning process will be analyzed in Chapter 7.

The *Greenbelt Act* of 2005 enabled the creation of a Greenbelt Plan to protect roughly 728,000 hectares of environmentally sensitive and agricultural land in the Golden Horseshoe area of Ontario from urban development and sprawl. The Greenbelt Plan includes lands within, and builds upon the ecological protections provided by, the Niagara Escarpment Plan (NEP) and the Oak Ridges Moraine Conservation Plan (ORMCP). It also complements and supports other provincial level initiatives such as the Parkway Belt West Plan and the Rouge North Management Plan. (MMAH, 2005). The *Greenbelt Act* is significant to planning for landscape connectivity in Ontario as its objectives include establishing a network of countryside and open space areas which supports the Oak Ridges Moraine and the Niagara Escarpment; promoting connections between lakes and the Oak Ridges Moraine and Niagara Escarpment; and promoting linkages between ecosystems and provincial parks or public lands (MMAH, 2005). The Greenbelt Plan includes the goal of "Protection and restoration of natural and open space connections between the Oak Ridges Moraine, the Niagara Escarpment, Lake Ontario, Lake Simcoe and the major river valley lands, while also maintaining connections to the broader natural systems of southern Ontario beyond the Golden Horseshoe such as the Great Lakes Coast, the Carolinian Zone, the Lake Erie Basin, the Kawartha Highlands and the Algonquin to Adirondacks Corridor (MMAH, 2005). The *Greenbelt Act* and Plan will be analyzed in Chapter 5.

The *Ontario Biodiversity Strategy* (OBS) was released by the MNR in June of 2005. The OBS is intended to help Ontario fulfill its commitments in relation to the *Canadian Biodiversity Strategy* and the *UN Convention on Biological Diversity*. To that end, it sets out a vision, goals, and a list of 37 actions that will enable Ontario to

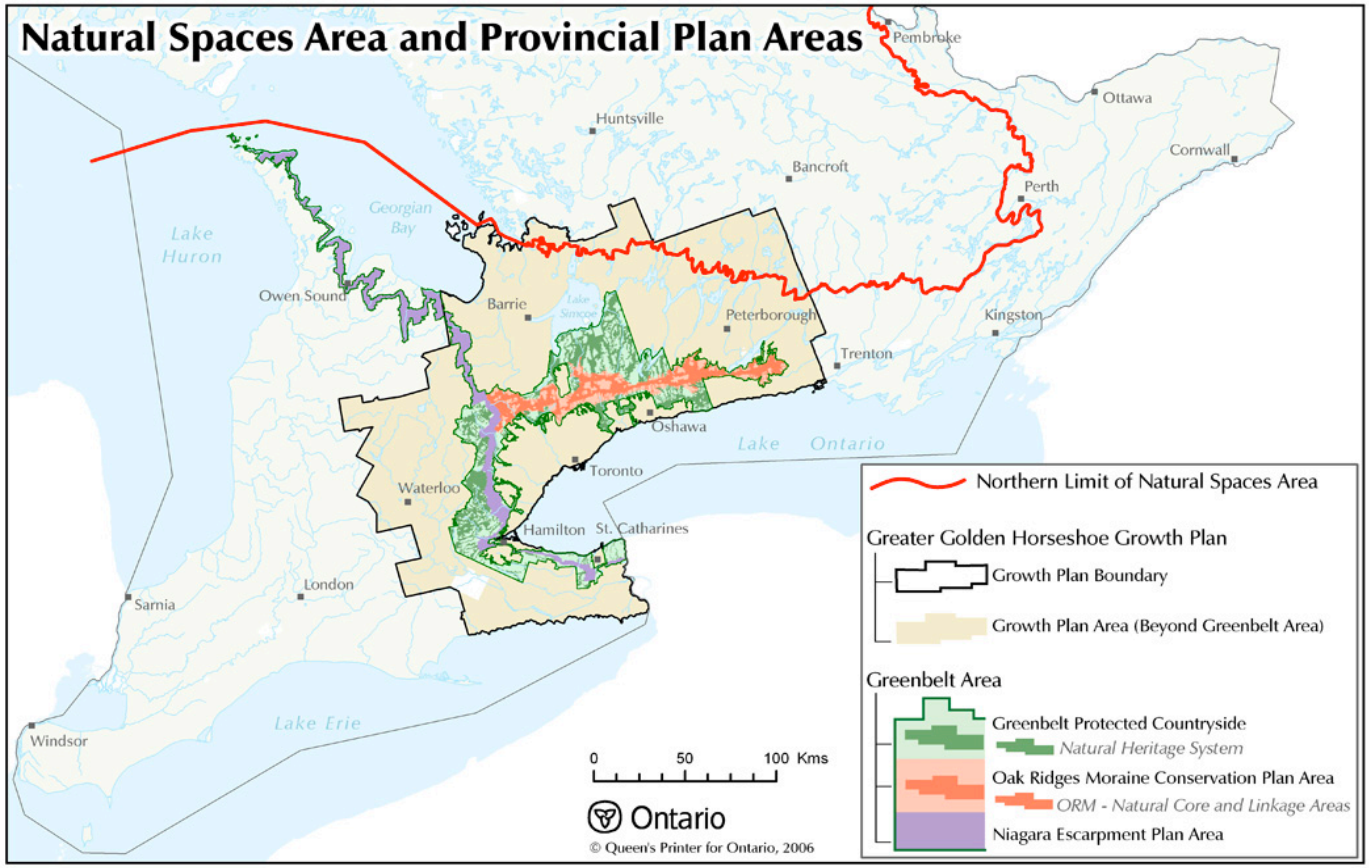
achieve its biodiversity goals. Key strategic actions recommended by the OBS include work to re-establish and retain natural linkages and connectivity between natural features and areas on the landscape, including the Greenbelt, as well as conserving a network of natural systems through the Natural Spaces program (OMNR, 2005). The OBS will be analyzed in Chapter 5.

Shortly after the OBS was released, the MNR announced the *Natural Spaces Program* in August of 2005. Its mandate is "to establish a framework and mechanisms for conservation and restoration of healthy ecosystems in southern Ontario" (OMNR, 2006, p. 2). It is intended to complement other provincial initiatives, including the ORM Plan, the Greenbelt Plan, the NEP and the OBS. The MNR is developing a Natural Spaces approach to identifying natural heritage systems at the landscape scale in southern Ontario, which it will promote for voluntary use by municipalities, conservation authorities, conservation groups and others, in order to 1) provide a strategic framework for stewardship and securement activities, and 2) provide technical guidance to inform municipal planning under the PPS (OMNR, 2006, p.3). The approach is geared to achieve consistency with the PPS for areas outside of the Greenbelt planning area. Landscape connectivity features prominently in this natural heritage systems approach, as the approach:

> …facilitates ecosystem planning and management across planning boundaries by identifying an ecological system that includes natural linkages and the natural areas they connect. Linkages are important because they support ecological functions between natural areas, including species and genetic migration and hydrologic connectivity. Woodlands, wetlands, stream corridors and habitats of significance are some of the features that are fundamental components of the cores and linkages in natural heritage systems.
> Natural heritage systems also may include protected areas such as parks, and areas that have potential to be restored in order to increase natural cover and connectivity within the system (OMNR, 2006, p.6-7).

This program, then, could have important implications for planning for landscape connectivity in southern Ontario (see Figure 4.1).

Figure 4.1. Natural Spaces Area and Provincial Plan Areas



(OMNR, 2006, p.4)

4.5 Conclusion

The concept of landscape connectivity was recognized in Ontario's land use planning system in the 1970s and 1980s and, by the 1990s, was present in a range of ministry reports, regional and provincial strategies, and provincial policies. By 2008, the concept of landscape connectivity had moved from theory to practice and was well established within polices, programs and provincial legislation. For example, in 1995 the *Lake Ontario Greenway Strategy* called for the need to fully recognize the importance of habitat connections within the Oak Ridges Moraine in provincial policies. By 2002, provincial policies and land use planning legislation had been established which recognized and protected the landscape connectivity value of the ORM.

Landscape connectivity, as a concept, has gained acceptance in Ontario to the point that it has transcended political change. For example, the change in provincial government from the environmentally-responsible and socialist New Democratic Party, in power from 1990 to 1995, to the notoriously anti-environmental Progressive Conservative Party elected in 1995, led to major changes in policy and legislation but the concept of "natural connections" remained in the revised PPS in 1997. Following the election of the centrist Liberal Party in 2003, the concept of landscape connectivity was again retained, and strengthened, in the new PPS of 2005.

In conclusion, Chapter 4 has demonstrated that there has been a movement from theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008. The introduction of conservation biology principles, including landscape connectivity, created a growing public awareness, which contributed to rising pressure on the Ontario government to reform not only its land use planning policies but its entire land use planning system. The theory of landscape connectivity is included in

key land use planning legislation and policies and is now an accepted part of planning for natural heritage in the province. The following Chapter will examine these key documents in detail with a content analysis of Ontario's land use planning legislation, policies and supporting documents for landscape connectivity content between 1970 and 2008.

5 Content Analysis of Landscape Connectivity in Ontario's Land Use Planning Law and Policy

5.1 Introduction

Chapter 5 presents a content analysis of Ontario's land use planning legislation, policies, and supporting documents for landscape connectivity content between January 1970 and January 2008. The research question for this problem-driven content analysis is: *How does Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity in the 1970-2008 period?*

5.2 Content Analysis Design

The research design for a content analysis should consist of "detailed specifications that guide the handling of data and make the research reproducible and critically examinable at a later point in time" (Krippendorff, 2004, p. 340). This section presents the research design that was used for this chapter's content analysis, including the research questions, context, relevant texts and sampling, unit of analysis, coding and recording procedures, analytical procedure, and standards.

5.2.1 Research Question(s)

Research questions in content analysis should: 1) concern currently unobserved phenomena in the problematized context of available texts; 2) have several possible answers; and, 3) be validatable in principle, in that at least one other way to answer that question, independent of the content analysis, is presented (Krippendorff, 2004). The main research question for this content analysis is:

> ***How does Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity in the 1970-2008 period?***

Possible answers for this question are: ***Explicitly, Indirectly,*** *or* ***No direction***.

Subsets to the main question are:

> ***What statements are used in reference to landscape connectivity in Ontario's land use planning law and policy?***
>
> Possible answers are: ***Imperative, positive, advisory,*** or ***neutral.***
>
> ***How does Ontario's land use planning law and policy portray the concept of landscape connectivity?***
>
> Possible answers for this question are: ***As a positive concept, a neutral concept, a negative concept,*** or ***as a concept with both positive and negative aspects.***

The answers to these research questions can be validated by the results of the case studies presented in Chapter 6 and the literature review in Chapter 4.

5.2.2 Context

The context for this content analysis is the field of land use planning within Ontario. The texts chosen for analysis are the documents used for guidance and for reference that inform planners and the planning process in the Province. Intended readers of the relevant texts are planners, practitioners in a field related to planning, or other practitioners interested in some aspect of the planning process. The texts are, in many cases, interconnected, and not intended to be read in isolation of each other. For example, the *Planning Act* guides land use planning on private land in Ontario. The Provincial Policy Statement (PPS) is meant to provide "strong, clear policy direction on land use planning" under the Planning Act (MMAH, 2007). The Natural Heritage Reference Manual is a supporting document to the PPS and serves as a guide to the application of technical matters (OMNR, 1999). The Natural Heritage Reference Manual, therefore, would not be read alone but in tandem with the *Planning Act* and the PPS. Also, the land use planning system in Ontario is a policy-led system and it is

designed such that the lower order documents are much more detailed than the higher order documents. For example, the Natural Heritage Reference Manual will likely contain more landscape connectivity statements than the PPS, which will in turn likely contain more landscape connectivity statements than the *Planning Act*.

5.2.3 Relevant Texts and Sampling

A text is considered relevant for a content analysis if there is evidence for an assumption of stable correlations between that text and answers to the research question (Krippendorff, 2004). The research question posed here asks how Ontario's planning law and policy directs planners to apply the concept of landscape connectivity between 1970 and 2008, and the possible answers are explicitly, indirectly and no direction. Relevant texts for this content analysis are thus land use planning legislation, policies and relevant supporting documents provided by the Government of Ontario for use by planners between January 1970 and January 2008.

Content analysis often deals with vast amounts of available texts and content analysts may be required to choose a smaller sample of texts for their analysis. Types of sampling include random, systematic, stratified, varying probability, cluster, snowball, relevance, census, and convenience (Krippendorff, 2004). Relevance sampling was used for this content analysis. Relevance sampling, also called purposive sampling, aims to select all documents that contribute to answering the given research questions. With this technique, an analyst follows a conceptual hierarchy and systematically lowers the number of units considered for analysis (Krippendorf, 2004). A total of 48 documents were examined for this content analysis (see Table 5.1). For details on the type and purpose of each document, refer to Appendix A.

Table 5.1 Relevant Documents for Content Analysis

Planning Document	Type of Document
Comprehensive Set of Policy Statements (1994)	Policy
Implementation Guidelines for the Comprehensive Set of Policy Statements (1995)	Guidance
Conservation Authorities Act (1946, RSO 1990)	Legislation
Conservation Land Act (1988, RSO 1990)	Legislation
Crown Forest Sustainability Act (1994)	Legislation
Endangered Species Act (1971, RSO 1990)	Legislation
Endangered Species Act (2007)	Legislation
Flood Plain Planning Policy (1988)	Policy
*Greenbelt Ac*t (2005)	Legislation
Greenbelt Plan (2005)	Provincial Plan
Land use Planning for Housing Policy (1989)	Policy
Mineral Aggregate Resource Policy (1982)	Policy
Natural Heritage Reference Manual (1999)	Guidance
Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan (1997)	Ministry Plan
Niagara Escarpment Plan (1985)	Provincial Plan
Niagara Escarpment Plan (1994)	Provincial Plan
Niagara Escarpment Plan (2005)	Provincial Plan
Niagara Escarpment Planning and Development Act, (1973, RSO1990)	Legislation
Niagara Escarpment Protection Act (1970)	Legislation
Oak Ridges Moraine Conservation Act (2001)	Legislation
Oak Ridges Moraine Plan (2002)	Provincial Plan
Ontario Biodiversity Strategy (2005)	Strategy
Ontario Environmental Assessment Act (1990)	Legislation
Ontario Environmental Protection Act (1990)	Legislation
Ontario Forest Accord (1999)	Accord
Ontario Living Legacy Strategy (1999)	Strategy
Ontario Planning and Development Act (1994)	Legislation
Ontario Provincial Parks: Planning and Management Policies (1978)	Policy
Ontario Provincial Parks: Planning and Management Policies (1992)	Policy
Parkway Belt West Plan (1978)	Provincial Plan
Parkway Belt West Planning and Development Act (1973, 1990)	Legislation
Places to Grow Act (2005)	Legislation
Places to Grow: Growth Plan for the Greater Golden Horseshoe (2006)	Provincial Plan
Planning Act, R.S.O. (1944, RSO 1990)	Legislation
Planning and Conservation Land Statute Law Amendment Act, (2006)	Legislation
Provincial Parks Act (RSO 1990)	Legislation
Provincial Parks and Conservation Reserves Act (2006)	Legislation
Provincial Parks Policy Statement (1978)	Policy
Provincial Policy Statement 1996 (amended 1997)	Policy
Provincial Policy Statement (2005)	Policy
Public Lands Act (RSO 1990)	Legislation
Resource-Based Tourism Policy (1997))	Policy
Room to Grow Final Report (2002)	Guidance
Room to Grow (2003)	Policy
Significant Wildlife Habitat Technical Guide (2000)	Guidance
Strong Communities Act (2004)	Legislation
Wetlands Policy (1992)	Policy
Wilderness Areas Act (RSO 1990)	Legislation

5.2.4 Unit of Analysis

The definition of units of analysis is an important step in content analysis. If the units chosen are too small (e.g. words or expressions), the semantic validity will be affected and the content analysis may become shallow; if the units chosen are too large (e.g. entire documents or books), the content analysis becomes unreliable (Krippendorff, 2004). The unit of analysis chosen for this content analysis was a statement. A statement was defined as a sentence or group of sentences addressing the same issue. Each statement was weighted as one unit. Numbered, lettered or bullet points equal one unit each.

Each planning document was read in its entirety. Excluded from the analysis were table of contents, titles, subtitles, legends, organization names, and figures.

5.2.5 Coding and Recording Procedures

Formulation of clear instructions for coders (i.e. observers, interpreters, judges) is required if the results of the content analysis are to be replicable and able to meet scientific standards. Krippendorff (2004, p.351) recommends that the coder instructions include the following:

- A list of required qualifications for coders
- Descriptions of training procedures and instructional materials used to calibrate coders' conceptions
- Operational definitions of the recording and context units, and rules on how to distinguish them
- Operational definitions of the syntax and semantics of the data language that coders are to apply in describing, translating or categorizing each textual unit
- Copies of the form(s) to be used in creating records and entering data for processing: spreadsheets, examples of completed questionnaires, and tabulations

The Coding and Recording Procedures for this content analysis are presented in Appendix B

Applying the Provincial Policy Statement Infosheet (MMAH, 2005) was used as a guide to creating the coding procedures. The InfoSheet discusses the language of the PPS and its specific policies and how the "choice of language is intended to distinguish between the types of policies and the nature of implementation" (MMAH, 2005, p. 4). It identifies three types of policies in the PPS:

1. Policies that set out limitations and prohibitions, such as "development and site alteration shall not be permitted;"
2. Policies that set out positive directions, such as "settlement areas shall be the focus of growth;" and,
3. Policies that use enabling or supportive language, such as "should", "may", "promote" or "encourage."

The first type of policy does not allow for discretion, while the other two types of policies "provide some discretion on the way to achieve the specific policy goal" (MMAH 2005, p.4).

As the PPS is meant to be the basis of Ontario's land use planning system on private lands, this guide to interpretation serves as an appropriate model for the coding procedures. Four categories were created to which relevant statements could be assigned for the question, "*What statements are used in reference to landscape connectivity in Ontario's land use planning law and policy?"*

- If the statement contains limitations and prohibitions, then the statement is recorded as **imperative**. For example, "Development is not permitted in significant wildlife corridors".
- If the statement contains positive words such as "shall" or "will", then the statement is recorded as **positive**. For example, "In Natural Linkage Areas and Countryside Areas, new aggregate resource operations shall have to meet stringent review and approval standards."

- If statement contains enabling or supportive language, such as "should", "promote" or "encourage", then the statement is recorded as **advisory**. For example, "Municipalities should consider planning, design and construction practices that maintain or where possible enhance the size, diversity and connectivity of key natural heritage features."
- If statement contains no words that convey direction, then the statement is recorded as **neutral**. For example, "Connectivity means the degree to which key natural heritage or key hydrologic features are connected to one another by links such as plant and animal movement corridors, hydrologic and nutrient cycling, genetic transfer, and energy flow through food webs."

Similarly, four categories were created to which relevant statements could be assigned for the question, "*How does Ontario's land use planning law and policy portray the concept of landscape connectivity?"*

- If the statement portrays landscape connectivity as a positive concept, then the statement is recorded as **positive**. For example, "Corridors provide important ecological functions".
- If the statement portrays landscape connectivity as a neutral concept, then the statement is recorded as **neutral.** For example, "Utility right-of-ways may serve as potential animal movement corridors".
- If statement portrays landscape connectivity as a negative concept, then the statement is recorded as **negative**. For example, "Corridors accelerate the spread of invasive species".
- If statement portrays both positive and negative aspects of landscape connectivity, then the statement is recorded as **both positive and negative.** For example, "A corridor may be beneficial for some species but detrimental to others".

5.2.6 Analytical Procedure

Content analysts can choose from a variety of content analysis software programs or create their own procedure. These procedures take the form of "if-then" statements or rules of inference that take the analyst from the texts to the research question answer(s) and, provided that they are computable on the coded features of the texts, they make knowledge of the context transferable to other similar content analyses and allow for examination of the procedures by other researchers (Krippendorff, 2004). This content analysis uses manual coding. Computerized coding is faster but computer programs may not recognize broader or symbolic meanings of text. In addition, manual coding permitted a degree of flexibility that allowed for the inclusion of new terms in the analysis when required.

5.2.7 Standards

Standards are used to limit the uncertainty associated with the answers to content analysis research questions. Uncertainty exists because of: 1) the nature of the context of the texts being analyzed; 2) the extent of the analysts' knowledge of text-context correlations; and, 3) the care with which the content analysis is conducted (Krippendorff, 2004). Standards for functional, sampling, semantic and structural validity should be related to the level of validity required of the results (Krippendorff, 2004). The author of this dissertation was the sole analyst and sole coder for this content analysis, which limits variability.

5.3 Results

Of the 48 land use planning documents analyzed, 24 had landscape connectivity content (see Table 5.2).

Table 5.2 Landscape Connectivity in Ontario's Land Use Planning Law and Policy

Year	Planning Document	Landscape Connectivity Statements
1913, 1954, RSO 1990	*Provincial Parks Act*	0
1913, RSO 1990	*Public Lands Act*	0
1944, RSO 1990	*Planning Act*	1
1946, RSO 1990	*Conservation Authorities Act*	0
1959, RSO 1990	*Wilderness Areas Act*	0
1970	*Niagara Escarpment Protection Act*	1
1971, RSO 1990	*Endangered Species Act*	0
1973, RSO 1990	*Parkway Belt West Planning and Development Act*	0
1973, RSO 1990	*Niagara Escarpment Planning and Development Act*	1
1976, RSO 1990	*Ontario Environmental Assessment Act*	0
1976, RSO 1990	*Ontario Environmental Protection Act*	0
1978	Parkway Belt West Plan	10
1978	Ontario Provincial Parks: Planning and Management Policies	8
1985	Niagara Escarpment Plan	2
1988, RSO 1990	*Conservation Land Act*	0
1988	Flood Plain Planning Policy	0
1992	Wetlands Policy	3
1992	Ontario Provincial Parks: Planning and Management Policies	6
1994	Comprehensive Set of Policy Statements	9
1994	Niagara Escarpment Plan	28
1994	*Crown Forest Sustainability Act*	0
1994	*Ontario Planning and Development Act*	0
1995	Implementation Guidelines for the Comprehensive Set of Policy Statements	101
1997	Provincial Policy Statement	1
1997	Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan	23
1997	Resource-Based Tourism Policy	0
1999	Ontario Forest Accord	0
1999	Ontario Living Legacy Land Use Strategy	59
1999	Natural Heritage Reference Manual	100
2000	Significant Wildlife Habitat Technical Guide	306
2001	*Oak Ridges Moraine Conservation Act*	3
2002	Oak Ridges Moraine Conservation Plan	38
2002	Room to Grow Final Report	0
2003	Room to Grow Policy	0
2004	*Strong Communities Act*	0
2005	*Greenbelt Act*	3
2005	Provincial Policy Statement	3
2005	Niagara Escarpment Plan	29
2005	*Places to Grow Act*	0
2005	Ontario Biodiversity Strategy	12
2005	Greenbelt Plan	65
2006	Places to Grow: Growth Plan for the Greater Golden Horseshoe	2
2006	*Provincial Parks and Conservation Reserves Act*	0
2006	*Planning and Conservation Land Statute Law Amendment Act*	0
2007	*Endangered Species Act*	0

The 24 documents with landscape connectivity content were grouped into five categories for further analysis: legislation, policy statements, provincial plans, strategies, and guidance and supporting documents. For the purposes of this dissertation, the categories are defined as follows:

- Legislation, or statutory law, is law which has been enacted by a legislative or other governing body. For example, the *Planning Act* is legislation that sets the rules for land use planning in Ontario on patent lands.
- A policy statement is a document that contains guiding principles or rules that are meant to provide direction to planners. For example, the policies of the PPS 2005 are intended to "provide strong, clear policy direction on land use planning to promote strong communities, a clean and healthy environment and a strong economy" (MMAH, 2007).
- A plan is a document that articulates policies, goals and decisions processes, and the actions required to implement the policies (Eagles et al., 2002). A provincial plan is prepared by the Province of Ontario and promotes provincial interests. Examples include the Greenbelt Plan and the Oak Ridges Moraine Plan.
- A strategy is a high-level approach to an issue that is designed to deliver change by implementing policy. For example, the Ontario Biodiversity Strategy sets out a plan to conserve biodiversity, which includes strategic directions and recommended actions.

Guidance and supporting documents are meant to be read in tandem with the above documents and are used by planners for additional, detailed, information. For example, the Significant Wildlife Habitat Technical Guide is a technical manual that is meant to assist planning authorities and other participants in the municipal planning system, under the *Planning Act*, by providing detailed information on the identification, description and prioritization of significant wildlife habitat.

Table 5.3 presents the results of the content analysis for the question, "What statements are used in reference to landscape connectivity in Ontario's land use planning law and policy?"

Table 5.3 Types of Statements Used in Reference to Landscape Connectivity in Ontario's Land Use Planning Law and Policy

DOCUMENT TYPE	TYPE OF STATEMENT				
	Imperative	Positive	Advisory	Neutral	TOTAL
Legislation (5 documents)					
Observed	**3**	**4**	**2**	**1**	**10**
Percentage	**30%**	**40%**	**20%**	**10%**	
Policy Statements (6 documents)					
Observed	**4**	**3**	**7**	**16**	**30**
Percentage	**13.3%**	**10%**	**23.3%**	**53.3%**	
Provincial Plans (7 documents)					
Observed	**10**	**65**	**47**	**54**	**176**
Percentage	**5.7%**	**36.9%**	**26.7%**	**30.7%**	
Strategies (3 documents)					
Observed	**1**	**11**	**17**	**65**	**94**
Percentage	**1%**	**11.7%**	**18%**	**69.1%**	
Supporting/Guidance Documents (3 documents)					
Observed	**8**	**39**	**178**	**312**	**537**
Percentage	**1.5%**	**7.3%**	**33.1%**	**58.1%**	
TOTAL	**26**	**122**	**251**	**448**	**847**
Percentage	**3.1%**	**14.4%**	**29.6%**	**52.9%**	

The majority of the landscape connectivity statements in Ontario's planning law and policy were neutral in direction (52.9%). Almost a third of the statements were

advisory (29.6%). A small number of the statements were positive (14.4%) and very few statements were imperative (3.1%).

The next question in the content analysis was: "How does Ontario's land use planning law and policy portray the concept of landscape connectivity?" Table 5.4 presents the results.

Table 5.4 Portrayal of Landscape Connectivity in Ontario's Land Use Planning Law and Policy

DOCUMENT TYPE	PORTRAYAL OF LANDSCAPE CONNECTIVITY				
	Positive	Neutral	Negative	Both Positive and Negative	TOTAL
Legislation (5 documents)					
Observed	**8**	**2**	**0**	**0**	**10**
Percentage	**80%**	**20%**	**0%**	**0%**	
Policy Statements (6 documents)					
Observed	**13**	**17**	**0**	**0**	**30**
Percentage	**43.3%**	**56.7%**	**0%**	**0%**	
Provincial Plans (7 documents)					
Observed	**70**	**106**	**0**	**0**	**176**
Percentage	**39.8%**	**60.2%**	**0%**	**0%**	
Strategies (3 documents)					
Observed	**23**	**71**	**0**	**0**	**94**
Percentage	**24.5%**	**75.5%**	**0%**	**0%**	
Supporting/Guidance Documents (3 documents)					
Observed	**258**	**269**	**4**	**6**	**537**
Percentage	**48.1%**	**50.1%**	**0.7%**	**1.1%**	
TOTAL	**372**	**465**	**4**	**6**	**847**
Percentage	**43.9%**	**54.9%**	**0.5%**	**0.7%**	

In the majority of landscape connectivity statements, the concept is portrayed as positive (43.9%) or neutral (54.9%). Very few statements portray landscape connectivity as negative (0.5%) or portray both the positive and negative aspects of landscape connectivity (0.7%).

5.4 Discussion

What statements are used in reference to landscape connectivity in Ontario's land use planning law and policy?

The majority of the landscape connectivity statements in Ontario's planning law and policy are neutral in direction (52.9%), a third of the statements are advisory (29.6%), a small number of the statements are positive (14.3%) and very few statements are imperative (3.1%). This implies that Ontario's planning law and policy is not providing strong direction to planners on the issue of landscape connectivity. It seems appropriate that the majority of the landscape connectivity statements in the Supporting/Guidance documents are neutral, given the nature of the documents, but it does not seem appropriate that the majority of the landscape connectivity statements in the Policy Statements (53.3%) and in the Strategies (69.1%) are neutral in direction. A policy statement should provide clear, strong direction for planners. Likewise, a strategy should provide clear direction to help planners move from policies to actions.

The results for the Provincial Plans are more balanced: 36.9% of the statements are positive in direction, 5.7% are imperative, 26.7% were advisory, and 30.7% are neutral. There are only 10 landscape connectivity statements in total for the Legislation, which does not provide much of a sample, but nonetheless 30% of those statements are imperative, 40% are positive, 20% are advisory and only 10% are neutral.

How does Ontario's land use planning law and policy portray the concept of landscape connectivity?

The majority of landscape connectivity statements in Ontario's land use planning law and policy portray the concept of landscape connectivity as either positive (43.9%) or neutral (54.9%). As explained by Taylor et al (2006), landscape connectivity is inherently neither good nor bad; connectivity may positively influence population persistence for some organisms in some situations, and negatively influence them in others. It is appropriate, therefore, that the majority of the statements portray landscape connectivity as a neutral concept.

The only type of documents that mentioned either negative or both positive and negative aspects of landscape connectivity were Supporting/Guidance Documents. For example, The Significant Wildlife Habitat Technical Guide states that a corridor may be beneficial for some species but detrimental to others. It also states that natural areas that have been historically isolated should not be connected as they are unique and have evolved to their existing condition.

Maintaining and enhancing landscape connectivity is often good planning practice, but not always. There are situations where landscape connectivity is not feasible or desirable. Enhancing connectivity can facilitate the spread of invasive species, accelerate the spread of pathogens, alter source-sink dynamics, and prevent local adaptation (Bennett, 2003; Crooks and Suarez, 2006; Dobson et al., 1999; Simberloff et al., 1992). However, a planner without a working knowledge of conservation biology might assume, on reading Ontario's land use planning law and policy documents, that there are no negative aspects of landscape connectivity. This could lead to the inappropriate usage of the concept, such as creating a wildlife corridor to link previously unconnected areas, which could have a detrimental or even disastrous result. As noted by Taylor et al., such "well-intentioned but misguided

application" of connectivity concepts will not only harm the land but also "erode our credibility as scientists and practitioners" (Taylor et al., 2006, p. 36). Although there are few situations in Southern Ontario where creating or preserving connectivity would be negative, it is important that planners be aware of both positive and negative aspects of the concept and that landscape connectivity be assessed on an individual case study basis.

How does Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity?

The quantitative results presented above demonstrated that over half of the landscape connectivity statements are neutral and thus convey no direction. A third of the statements are advisory and only a very small number are positive or imperative. The concept of landscape connectivity itself is largely portrayed as either a positive or neutral concept. In order to further answer the main question of the content analysis, the next section will expand on the quantitative results of the content analysis and provide a qualitative examination of landscape connectivity within Ontario's land use planning law and policy.

This qualitative analysis is based on explicit statements within those 24 documents that contain landscape connectivity content (see Table 5.2). There are some statements in the documents which could be construed as being relevant to landscape connectivity but which do not mention it directly. For example, the *Planning Act* can be interpreted to include ecosystem fragmentation as a planning issue within its statutory objectives (see Wilkinson, 2002), but it is not stated explicitly. The goal here is to search only for explicit meanings and thus only statements containing at least one of the explicit landscape connectivity search terms (see Appendix B Coding and Recording Procedures) are included in this content analysis.

The qualitative content analysis shows that, in general, there has been an increase in direction for planners between 1970 and 2008. Chapter 4 has already presented a timeline for the movement from theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008, so the focus for this section will be presenting key highlights of how the documents direct planners to apply the concept of landscape connectivity. Full descriptions for each document are found in Appendix C: Landscape Connectivity Content within Ontario's Land Use Planning Law and Policy.

There were several documents from the 1970s and 1980s which raised the issue of landscape connectivity but provided little in the way of direction for planners. This is not surprising, as the concept of landscape connectivity was relatively new to Ontario at the time these documents were written. For example, the purpose of the 1973 *Niagara Escarpment Planning and Development Act* is to "provide for the maintenance of the Niagara Escarpment and land in its vicinity as a ***continuous natural environment*** and to ensure only such development occurs as is compatible with that natural environment". The *Niagara Escarpment Planning and Development Act* directs the Niagara Escarpment Commission to plan at the provincial level for Niagara Escarpment ecosystems that transcend municipal boundaries. Although the concept of landscape connectivity is found in this statement of purpose, this is the only statement in the Act which refers to landscape connectivity and, so, the legislation provides little in the way of direction or guidance for planners. Direction for planners should be found in the 1985 Niagara Escarpment Plan, which contains two landscape connectivity statements. Both of these statements were descriptive and referred to the Bruce Trail as "an essential component of the Niagara Escarpment Parks System linking parks and natural features" (Niagara Escarpment Commission, 1985, p. 32). There was no direction for planners on ecological linkages.

Likewise, the 1978 Ontario Provincial Parks: Planning and Management Policies described how Northern Wilderness Parks would, over time, "increasingly become "islands" or refuges of plant and animal communities sensitive to …development" (OMNR, 1978, p. Wi-II-1). Another statement mentioned, "In Southern Ontario, the original forest stands have almost entirely diminished to isolated woodlots" (OMNR, 1978, p. NR-1-8). The document thus acknowledged the issue of landscape connectivity but did not provide much in the way of direction for planners.

There were 10 documents from the 1990s that were analyzed with regards to how Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity. The first is the *Planning Act R.S.O 1990,* which contains two landscape connectivity statements, located in Section V Land Use Control and Administration, Chapter 34 Zoning By-Laws. It gives local municipalities the authority to pass by-laws concerning:

> Natural features and areas
>
> 3.2 For prohibiting any use of land and the erecting, locating or using of any class or classes of buildings or structures within any defined area or areas,
>
> i. that is a significant wildlife habitat, wetland, woodland, ravine, valley or area of natural and scientific interest,
>
> ii. that is a ***significant corridor*** or shoreline of a lake, river or stream, or
>
> iii. that is a ***significant natural corridor***, feature or area.

Thus the *Planning Act*, as of 1990, directs planners at the local scale to protect significant aquatic and natural corridors. This is significant, as the *Planning Act* sets the rules for the land use planning system in Ontario.

"Significant natural corridors", as listed in the *Planning Act* above, are included in the list of natural heritage features and areas to be protected in the 1994 Comprehensive Set of Policy Statements. There are nine landscape connectivity statements in the Comprehensive Set of Policy Statements. The 1995 Implementation

Guidelines for the Comprehensive Set of Policy Statements contain 101 landscape connectivity statements, including a detailed section explaining how to evaluate significant natural corridors and the planning implications of the significant natural corridor policy. The Implementation Guidelines also included a detailed section (see 2.2.7, p. 31) on significant natural corridors, which explained:

- The ecological benefits of corridors
- The importance of planning for corridors in Ontario
- How to evaluate corridors
- The planning implications of the significant natural corridor policy
- Where to find further information on corridors

As discussed in Chapter Four, the Comprehensive Set of Policy Statements and the Implementation Guidelines provided municipal planners with clear direction and detailed information on planning for landscape connectivity.

The NEP was revised in 1994. Aside from many statements about the Bruce Trail, there is only the following statement in the revised NEP that directs planners to maintain connectivity. Section 2.8 Wildlife Habitat states:

> 2. ***Development shall be designed so as to***:
> a) minimize the impacts upon wildlife habitat, in particular, rare, vulnerable, threatened plant or animal species, as identified by onsite evaluation;
> b) ***maintain wildlife corridors and linkages with adjacent area*s**; and
> c) enhance wildlife habitat wherever possible. (Niagara Escarpment Commission 1994, p.52).

Note that this statement does not prohibit development in wildlife habitat or linkages, but requires that development shall be designed so as to maintain connectivity.

The 1996 Provincial Policy Statement (revised 1997), which replaced the Comprehensive Set of Policy Statements, contains only one landscape connectivity statement:

> 2.3.3 The diversity of natural features in an area, and the ***natural connections between them*** should be maintained, and improved where possible.

Thus, this document provided planners with considerably less direction than the Comprehensive Set of Policy Statements that it replaced. Corridors were removed from the list of natural heritage features and areas to be protected and did not even merit a definition. The term "natural connections" was not defined or explained. Also, planners were now required to "have regard to" the policies in the PPS, which is a weaker test than the "shall be consistent with" phrasing of the Comprehensive Set of Policy Statements and thus a lower policy implementation standard. These 1996 and 1997 PPS documents were prepared under the right wing Harris Government that was pro-development and therefore weakened environmental policy in order to allow development to go forward faster and easier. For example, the changes strengthened the ability of developers to challenge municipal planning decisions before the OMB, while limiting the roles of the Ministry of Natural Resources and Ministry of Environment in the planning process (Winfield et al, 2003).

The next example is found in 1997's Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan, which contains 23 landscape connectivity statements. The goal of the plan is "To establish a system of protected natural heritage areas, representing the full spectrum of the province's natural features and ecosystems" (OMNR, 1997, p. 3). Thus the plan has the potential to affect the entire province. One of the objectives is to protect the proposed system of natural heritage areas through legislation, regulation, policies and programs. Nature's Best recognizes linkages as an important criterion for designing natural heritage systems.

Interestingly, Nature's Best is the only plan examined for this content analysis that formally acknowledges the need for improved information related to landscape connectivity. As part of determining information and research priorities related to science principles and natural heritage areas, the plan states the need to,

> (i) Support research studies (including review of literature and existing knowledge) to ***improve information and knowledge on science principles related to natural corridors, linkages between natural heritage areas*** and ecosystem management (OMNR, 1997, p.33).

Overall, however, the plan provides little in the way of concrete direction for planners with regard to landscape connectivity.

Nature's Best was released by the OMNR in February 1997 and was one of the initiatives which the OMNR pledged to implement through 1999's Ontario Living Legacy Land Use Strategy (OLL). The OLL Land Use Strategy contains 59 landscape connectivity statements. All but two of the statements occur in an appendix to the main document (Appendix A: Summary of Land Use Areas and Area-specific Policies). Almost all of these statements are descriptive and very few contain direction for planners. For example, most of the statements are similar to the following,

> ID:E2229w. Area Description: This ***important caribou travel corridor links Lake Nipigon and Onaman Lake*** along the southern boundary on the Onaman River, and has ***significance*** related to its location near the southern limit of caribou range. Extensive forest operations and associated access occurs in this ***corridor***, as well as recreational angling and hunting (OMNR, 1999, p. 133).

This statement merely describes the existing condition of the corridor. Only a few statements contain any direction for planners, such as,

> ID:E2251w. Land Use Intent: ***Forestry activities will be planned to protect caribou habitat and enhance travel routes*** from Lake Nipigon to Wabakimi Park in Ogoki Lake area. ***Management activities and prescriptions will consider landscape and ecological linkages***, and in particular ***the need to maintain a linked network of mature forest tracts*** between Lake Nipigon and Wabakimi Park (OMNR, 1999, p.134).

This statement directs planners to enhance caribou travel routes and consider landscape and ecological linkages. There are only a handful of such directive statements regarding landscape connectivity in the strategy. The OLL Strategy resulted in the protection of a corridor between Wabakimi Provincial Park and Lake Superior and the creation of 36 new waterways parks that serve as "river corridor linkages" between core protected areas (National Round Table on the Environment and the Economy, 2003). However, there is very little direction found in the actual document with regard to planning for landscape connectivity. Indeed, connectivity between protected areas was later raised as an outstanding issue on which more work must be done (National Round Table on the Environment and the Economy, 2003). The OLL Strategy will be discussed further in Chapter 7.

Also released in 1999 was the Natural Heritage Reference Manual (NHRM). This guidance document to the Provincial Policy Statement under the *Planning Act* contains 130 landscape connectivity statements. The NHRM recommends the use of a natural heritage system approach to "encourage(s) planning authorities to go beyond the protection of specific natural heritage features and areas to consider the overall diversity and interconnectivity of natural features or areas" (OMNR 1999, p. 35). It is important to note, however, that this natural heritage system approach is voluntary and therefore, so too, is its landscape connectivity content. The NHRM refers to *The Natural Heritage of Southern Ontario's Settled Landscapes* (Riley and Mohr 1994) for a more complete description of the natural heritage system approach. It then states, "An ecological specialist can assist a planning authority in developing a natural heritage system that meets its particular circumstances" (OMNR 1999, p. 40). This very simple but important statement acknowledges the complexity of planning for natural heritage systems and the need for specialized assistance. General planners, even with the

detailed guidance provided by the NHRM and SWHTG, are not qualified to plan for landscape connectivity.

Although elements of landscape connectivity are referred to throughout the NHRM, the language used tends to be weak. For example, a description of wildlife movement corridors states that they "***can provide*** critical links between shelter, feeding, watering, growing and nesting locations" and continues,

> Wildlife movement corridors ***can be valuable*** at different spatial scales. For example, corridors that ***might be important*** at local (i.e., municipal) or regional (e.g., watershed, site district, site region) scales are those that: allow large mammals, such as deer, to move from their summer range to wintering areas; and allow wildlife to move freely between different parts of their habitat on a daily, seasonal or annual basis (e.g., from winter hibernation habitat to summer range) (OMNR 1999, p.29).

The use of the words "can" and "might" lessens the implied importance of corridors and their functions. Despite the weak wording, the NHRM does contain useful direction for planners. Along with ecological factors, the NHRM also considers other factors important to planning for landscape connectivity, such as public input, land tenure and "the feasibility of connecting, maintaining or improving natural heritage features and areas within the context of social and economic considerations" (OMNR 1999, p.39). It recommends that, "the municipality should work with private landowners to ensure that connecting links on private land are consistent with their needs and objectives" (OMNR 1999, p.39). Overall, the NHRM does provide useful general direction for planning for landscape connectivity but its effectiveness is weakened by its discretionary status.

The OMNR released the Significant Wildlife Habitat Technical Guide (SWHTG) in 2000. The SWHTG is another guidance document to the Provincial Policy Statement under the *Planning Act,* and it contains 306 landscape connectivity statements. The SWHTG is a more detailed technical manual than the NHRM and it is

"intended for use by ecologists, biologists, environmental planners and others involved in the development of strategies to identify and protect significant wildlife in the municipal planning process" (OMNR, 2000, p.2). Like the NHRM, the SWHTG is advisory only.

The landscape connectivity focus of the SWHTG is animal movement corridors, defined as,

> ***Animal movement corridors are elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another***. They exist at different scales and frequently link or border natural areas. Animal movement corridors encompass a wide variety of landscape features including riparian zones and shorelines, wetland buffers, stream and river valleys, woodlands, and anthropogenic features such as hydro and pipeline corridors, abandoned road and rail allowances, and fencerows and windbreaks. The Natural Heritage Component of the Provincial Policy Statement states that ***natural connections between natural features should be maintained and improved where possible*** (OMNR, 2000, p. 57).

There are too many landscape connectivity statements in the SWHTG and its voluminous appendices to summarize here, but suffice it to say that the SWHTG provides detailed direction to planners on the identification of significant wildlife movement corridors, However, like the NHRM, the use of the SWHTG is discretionary.

The *Oak Ridges Moraine Conservation Act* was enacted in 2001. There are three landscape connectivity statements in the *Oak Ridges Moraine Conservation Act*. The first statement occurs in the Interpretation section of the Act and refers to "natural linkage areas". The second statement occurs in the Review section and states that a review under the Greenbelt Plan "shall not consider removing land from the natural core areas or the natural linkage areas" (Government of Ontario, 2001, c.31, s.3 (4)). This statement provides clear direction to planners to protect existing ORM linkages from future requests to remove land under the Greenbelt Plan. The third statement occurs in the Objectives section of the Act and states that one of the objectives of the

Oak Ridges Moraine Plan is, “ensuring that the Oak Ridges Moraine Area is maintained as a ***continuous natural landform and environment*** for the benefit of present and future generations (Government of Ontario, 2001, c. 31, s. 4.). This statement supports the concept of landscape connectivity. Direction for planners is found in the Oak Ridges Moraine Conservation Plan, discussed below.

The Oak Ridges Moraine Conservation Plan (ORCMP) contains 38 landscape connectivity statements. According to the ORMCP, the Ontario government's vision for the Oak Ridges Moraine is that of "a continuous band of green rolling hills that provides form and structure to south-central Ontario, while protecting the ecological and hydrological features and functions that support the health and well-being of the region's residents and ecosystems" (MMAH, 2002, p.-1-). The ORMCP defines connectivity as “the degree to which key natural features are connected to one another by links such as plant and animal movement corridors, hydrological and nutrient cycling, genetic transfer, and energy flows through food webs (MMAH, 2002, p. 5).

The ORMCP divides the Oak Ridges Moraine into four land use designations: Natural Core Areas (38%), Natural Linkage Areas (24%), Countryside (30%) and Settlement Areas (8%). Natural Linkage Areas are “areas forming part of a central corridor system that support or have the potential to support movement of plants and animals among the Natural Core Areas, Natural Linkage Areas, river valleys and stream corridors” (MMAH, 2002, p. 18). The purpose of Natural Linkage Areas is,

> to maintain, and where possible improve or restore, the ecological integrity of the Plan Area, *and* ***to maintain, and where possible improve or restore, regional-scale open space linkages between Natural Core Areas and along river valleys and stream corridors***, by,
> (a) ***maintaining, and where possible improving or restoring***, the health, diversity, size, and ***connectivity*** of key heritage features, hydrologically sensitive features and the related ecological functions;
> (b) ***maintaining, and where possible improving or restoring*** natural self sustaining vegetation over large parts of the area ***to facilitate movement of plants and animals*;**

> (c) ***maintaining a natural continuous east-west connection and additional connections to river valleys and streams north and south of the Plan Area*;**
> (d) maintaining the quantity and quality of groundwater and surface water;
> (e) maintaining groundwater recharge;
> (f) maintaining natural stream form and flow characteristics; and
> (g) protecting landform features.

Thus the ORMCP directs planners to maintain and, where possible, improve and restore regional-scale linkages and natural vegetation that facilitates animal and plant movement. The ORMCP also directs planners to maintain both the east-west connection and connections to valleys and streams north and south of the ORM plan area.

Section 20 of the ORMCP supports connectivity within Natural Linkage Areas and Natural Core Areas,

> Every application for development or site alteration shall identify planning, design and construction practices ***that ensure that no buildings or other site alterations impede the movement of plants and animals*** among key natural heritage features, hydrologically sensitive features and adjacent land within Natural Core Areas and Natural Linkage Areas (MMAH, 2002, p.29).

Development applications are thus required to include plans for maintaining connectivity within Natural Core Areas and Natural Linkage Areas. Likewise, Section 23(1) requires that a Natural Heritage Evaluation be prepared for any application that proposes development within 120 meters of key natural heritage features, which shall,

> (b) identify planning, design and construction practices that will ***maintain and, where possible, improve or restore*** the health, diversity and size of the key natural heritage feature and its ***connectivity with other key natural heritage features;***
> (c) in the case of an application relating to land in a Natural Core Area, Natural Linkage Area or Countryside Area, ***demonstrate how connectivity within and between key natural heritage features will be maintained and, where possible, improved or restored before, during and after construction;***

These statements provide clear direction to planners, in that they require that development applications demonstrate how connectivity will be maintained and, where

possible, improved or restored, before, during and after construction. However, the ORMCP also permits a wide variety of land uses in Natural Linkage Areas, including,

> 1. Fish, wildlife and forest management.
> 2. Conservation projects and flood and erosion control projects.
> 3. Agricultural uses.
> 4. Transportation, infrastructure, and utilities as described in section 41, but only if the need for the project has been demonstrated and there is no reasonable alternative.
> 5. Home businesses.
> 6. Home industries.
> 7. Bed and breakfast establishments.
> 8. Farm vacation homes.
> 9. Low-intensity recreational uses as described in section 37.
> 10. Unserviced parks.
> 11. Mineral aggregate operations.
> 12. Wayside pits.
> 13. Uses accessory to the uses set out in paragraphs 1 to 12 (MMAH, 2002, p. 21).

Many of these uses are not compatible with maintaining landscape connectivity in the Natural Linkage Areas, specifically, or on the Oak Ridges Moraine in general. Uses 4 (Transportation, infrastructure and utilities), 11 (Mineral aggregate operations) and 12 (Wayside pits) are particularly problematic. As noted by the Environmental Commissioner of Ontario, allowing transportation and utilities, for example, throughout the entire Plan area seems contrary to its objectives (Environmental Commissioner of Ontario, 2005).

The ORMCP states that in Natural Linkage Areas and Countryside Areas, new aggregate resource operations and new transportation and utility corridors or facilities "shall have to meet stringent review and approval standards" (MMAH, 2002, p.-6). These standards do include requirements for maintaining landscape connectivity. For example, Section 35(2) states that an application for a mineral aggregate operation or wayside pit with respect to land in a Natural Linkage Area shall not be approved unless the applicant demonstrates,

> (3) In order to ***maintain connectivity***, when a mineral aggregate operation or a wayside pit is located in a Natural Linkage Area, ***there shall be at all times an excluded area (which, for greater certainty, may contain both undisturbed land and land whose rehabilitation is complete) that***,
> a) is ***at least 1.25 km wide***,
> b) ***lies outside the active or unrehabilitated portions*** of the area being used; and,
> c) ***connects parts of the Natural Linkage Area outside the mineral aggregate operation or wayside pit*** (MMAH, 2002, p.47).

This statement requires applications for mineral aggregate operations or wayside pits to demonstrate that connectivity will be maintained, and it demonstrates how the concept of landscape connectivity has changed in Ontario's law and policy since the 1970s. The Niagara Escarpment Plan (NEP), for example, through which 1973's *Niagara Escarpment Planning and Development Act* is implemented, allows aggregate extraction without any requirement for maintaining landscape connectivity. The NEP was first released in 1985, revised in 1994 and again in 2005, and though its landscape connectivity elements increased with each successive revision, it still does not contain the same emphasis on maintaining connectivity as more recent plans like the ORM and Greenbelt Plan.

However, allowing new mineral resource operations within Natural Linkage Areas is questionable, especially given the Oak Ridges Moraine's ecological and hydrological importance. The PPS also supports mineral aggregate extraction, as it does not even require the applicant to demonstrate need for said aggregate resource. Thus the ORMCP, with support of the PPS, directs planners to maintain connectivity while also directing them to allow an incompatible and, some might argue unnecessary, land use in ecologically and hydrologically valuable lands.

Section 41(2) states that an application for a transportation, infrastructure or utilities use with respect to land in a Natural Linkage Area shall not be approved unless:

> a) the need for the project has been demonstrated and there is ***no reasonable alternative***; and
> (b) the applicant demonstrates that the following requirements will be satisfied, ***to the extent that is possible*** while also meeting all applicable safety standards:
> 1. The area of construction disturbance will be kept to a minimum.
> 2. Right of way widths will be kept to the minimum that is consistent with meeting other objectives such as stormwater management and with locating as many transportation, infrastructure, and utility uses within a single corridor as possible.
> 3. The project ***will allow for wildlife movement***.
> 4. Lighting will be focused downwards and away from Natural Core Areas.
> 5. The planning, design and construction practices adopted will keep any adverse effects on the ecological integrity of the Plan Area to a minimum (MMAH, 2002, p.53).

The requirement of demonstrated need is an improvement over the mineral aggregate policy, but the wording "no reasonable alternative" and "to the extent that is possible" significantly weakens this policy as reasonable and possible are not defined.

Landscape connectivity is referred to throughout the ORMCP. It is a planning consideration not just in the Natural Core Areas and Natural Linkage Areas, but also in the Protected Countryside Areas and Settlement Areas. Clearly, there is significant landscape connectivity content in the ORMCP and it does provide good direction for planners. However, it may be difficult for planners to maintain landscape connectivity in the face of competing land use interests, such as aggregate extraction and transportation projects. Another difficulty is the fact that the responsibility for implementing the ORMCP lies with municipalities, and not the province. There is a valid concern that lower-tier municipalities may lack the resources and expertise needed to conduct the studies and reviews as required by the ORMCP (Environmental Commissioner of Ontario, 2002). This is especially true in the case of landscape

connectivity, as planning for this complex concept necessitates specialized assistance. The ORCMP will be discussed further in Chapter 7.

The year 2005 saw the introduction of several important laws and documents: the *Greenbelt Act* and Plan, the Ontario Biodiversity Strategy, a revised PPS and the Growth Plan for the Greater Golden Horseshoe. They will be discussed chronologically.

There are three landscape connectivity statements in the *Greenbelt Act*. The *Greenbelt Act* states that three of the eleven objectives of the Greenbelt Plan are:

> a) to ***establish a network of countryside and open space areas*** which supports the Oak Ridges Moraine and the Niagara Escarpment;
> f) to ***promote connections*** between lakes and the Oak Ridges Moraine and Niagara Escarpment; and,
> h) to ***promote linkages*** between ecosystems and provincial parks or public lands (Government of Ontario, 2005, c.1, s.5).

These statements direct planners to establish and promote linkages. However, some other objectives of the Greenbelt Plan may conflict with this direction.

Ontario's Greenbelt Plan is the largest greenbelt in the world (Carter-Whitney, 2008). The Greenbelt Plan area consists of 728,000 hectares and "brings together the existing plans for the Niagara Escarpment and the Oak Ridges Moraine as "anchors" and an additional 400,000 hectares of new Protected Countryside in the Golden Horseshoe, in order to rein in urban sprawl and save farmlands and natural areas" (ON, 2006, p.6). The Greenbelt Plan contains 65 landscape connectivity statements. The Greenbelt Plan defines connectivity as "the degree to which key natural heritage or key hydrologic features are connected to one another by links such as plant and animal movement corridors, hydrologic and nutrient cycling, genetic transfer, and energy flow through food webs (MMAH, 2005c, p.48). The Plan includes connectivity in its goals:

> 2. Environmental Protection.
> b) ***Protection and restoration of natural and open space connections*** between the Oak Ridges Moraine, the Niagara Escarpment, Lake

> Ontario, Lake Simcoe and the major river valley lands, while also ***maintaining connections to the broader natural systems of southern Ontario*** beyond the Golden Horseshoe such as the Great Lakes Coast, the Carolinian Zone, the Lake Erie Basin, the Kawartha Highlands and the ***Algonquin to Adirondacks Corridor*** (MMAH 2005c, p. 5).

Thus the Greenbelt Plan recognizes the importance of maintaining connectivity at a regional scale, both within and beyond the Golden Horseshoe.

There is significant landscape connectivity content throughout the Greenbelt Plan. Connectivity is featured in the Natural Heritage System Policies, General Non-Agricultural Use Policies, Recreational Policies, Shoreline Area Policies, General Infrastructure Policies, and Non-Renewable Resources Policies. These policies emphasize the importance of maintaining connectivity between natural heritage features. Direction ranges from positive (connectivity "shall be maintained or enhanced") to advisory (connections should "be considered").

The Greenbelt Plan also considers connectivity beyond its boundaries. Section 3.2.5 External Connections states,

> ***The Natural Heritage System is connected to local, regional and provincial scale natural heritage, water resource and agricultural systems beyond the boundaries of the Greenbelt. To support the connections*** between the Greenbelt's Natural System and the local, regional and broader scale natural heritage systems of southern Ontario, such as the Lake Ontario shoreline, including its remaining coastal wetlands, the Great Lakes Coast, Lake Simcoe, the Kawartha Highlands, the Carolinian Zone and the Algonquin to Adirondack Corridor, the federal government, municipalities, conservation authorities, other agencies and stakeholders should:
>
> 1. ***Consider how activities and land use change*** both within and abutting the Greenbelt ***relate to the areas of external connections*** identified in this Plan;
> 2. ***Promote and undertake appropriate planning and design to ensure that external connections are maintained and/or enhanced***; and
> 3. ***Undertake watershed based planning***, which integrates supporting ecological systems with those systems contained in this Plan (MMAH, 2005c, p.20).

This statement confirms that the Greenbelt Plan recognizes that the Natural Heritage System is connected to other systems at a local, regional and provincial scale and so, accordingly, the Plan promotes planning that maintains and enhances those external connections.

The Greenbelt Plan does not identify linkages as a natural heritage feature but it clearly does consider landscape connectivity to be an important component of the Greenbelt. However, the success of the Greenbelt Plan at maintaining connectivity may be limited. Greenbelts are a planning strategy in which development controls are placed on wide swaths of public and private land in order to control urban growth and protect natural features near cities; however, analyses have shown that they often fail to either control urban growth or protect natural features (Erickson, 2004). In the case of Ontario's Greenbelt Plan, its many objectives may trump landscape connectivity. A recent comparison of greenbelts around the world concluded that Ontario's Greenbelt Plan has the best legal protection (Carter-Whitney, 2008). However, as is the case with the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan, the Greenbelt Plan allows traffic and utility projects and aggregate extraction throughout the Plan area (Environmental Commissioner of Ontario, 2005). These exemptions pose a serious threat to landscape connectivity. For example, Section 4.2.1 General Infrastructure policies states that:

> Where infrastructure does cross the Natural Heritage System or intrude into or result in the loss of a key natural heritage feature or key hydrologic feature, including related land- form features, planning, design and construction practices shall minimize negative impacts and disturbance on the features or their related functions, ***and where reasonable, maintain or improve connectivity*** (MMAH, 2005c, p. 30).

The wording "where reasonable" is ambiguous and may not adequately maintain or improve connectivity. Indeed, allowing infrastructure throughout the plan area suggests that growth is prioritized over conservation. Wekerle et al. (2007) note that by

embedding growth policies in legislation that purportedly conserves natural heritage, the inevitability of growth is emphasized and the assumption is made that conservation can only be allowed if growth is also supported.

Despite the large size of the Greenbelt, there are calls to make it larger (Carter-Whitney, 2008). Ontario Nature, which holds a seat on the Greenbelt Council, views the Greenbelt as a "valuable building block" for a much broader greenway that it envisions as a system of core areas and connecting corridors throughout southern Ontario. Ontario Nature recommends adding lands to the Greenbelt and harmonizing the land use policies of the Greenbelt Plan, Oak Ridges Moraine Conservation Plan, and Niagara Escarpment Plan to preserve the strongest policies of each (Ontario Nature, 2006).

There are two inevitable outcomes of the Oak Ridges Moraine law and the Greenbelt law. One is increased intensification within the current urban areas. Another is a movement of land development pressure to rural areas beyond these areas. This leapfrog development moves the development pressure to other areas of the province that are on the outer fringe of the Oak Ridges Moraine and Greenbelt area (Hanna and Webber, 2005;Wekerle et al. 2007). Land use decisions made in relation to the ORM Act and Plan, for example, have been criticized for transferring urban development onto other ecologically sensitive areas, rather than reducing urban expansion as a whole (Winfield, 2003).

The PPS 2005 contains three landscape connectivity statements, as identified in bold in the quotes below. The PPS 2005 directs planners as follows:

> 2.1.2. The diversity and ***connectivity of natural features*** in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, ***should be maintained, restored or, where possible, improved, recognizing linkages*** between and among *natural heritage features and areas*, *surface water features* and *ground water features (MMAH, 2005a, p. 15).*

> 2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:
> e) ***maintaining linkages*** and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas *(MMAH, 2005a, p. 16)*.

Thus the PPS directs planners to maintain, restore or, where possible improve, connectivity. The third landscape connectivity statement is found in the definition of "natural heritage system":

> Natural heritage system: means a system made up of natural heritage features and areas, ***linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems.*** These systems can include lands that have been restored and areas with the potential to be restored to a natural state *(MMAH, 2005a, p. 33)*.

As explained in Chapter 4, the creation of the PPS 2005 coincided with the effective date of Section 2 of the *Strong Communities (Planning Amendment) Act, 2004*, which was introduced by the Liberal Government of Premier McGuinty and requires that planning decisions on applications that are subject to the new PPS "shall be consistent with" the new policies (MMAH 2007). Thus planners are required to be consistent with the policies of the PPS 2005, which include the concept of landscape connectivity. The wording of the actual policies has some problematic elements, however. The policy regarding water is straightforward: planning authorities *shall* protect, improve or restore the quality and quantity of water by maintaining linkages, and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas. The policy regarding natural heritage is less straightforward: the diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, *should* be maintained, restored or, *where possible*, improved*, recognizing* linkages between and among *natural heritage features and areas*, *surface water features* and *ground water features. Using "should" instead of "shall" renders the statement advisory in*

nature. The vague language such as "where possible" and "recognizing linkages" does not provide adequate guidance for planners. Such language can also be used to avoid dealing with the issue of connectivity. This language becomes more worrisome in light of the fact that the PPS 2005 requires planners to balance the protection of natural heritage with other matters of provincial interest, such as the protection of minerals and petroleum. Some contend that the PPS 2005 gives access to aggregate resources priority over other land uses (Environmental Commissioner of Ontario, 2005; Environmental Commissioner of Ontario, 2007; Winfield and Taylor, 2005). Existing and new mineral aggregate resource extraction is currently allowed in natural heritage systems and features. The protection of mineral aggregate resources trumps other land uses, such as natural heritage protection and agriculture. The wording of the PPS is such that it favours protection of mineral and petroleum resources and mineral aggregate resources over natural heritage protection. For example, the following is a new addition to the PPS 2005;

> *2.5.2.1. As much of the mineral aggregate resources as is realistically possible shall be made available to markets as close as possible.* ***Demonstration of need for mineral aggregate resources, including any kind of supply/demand analysis, shall not be not required****,* notwithstanding the availability, designation or licensing for extraction of mineral aggregate resources locally or elsewhere *(MMAH, 2005a, p. 19).*

*As noted by the Coalition on the Niagara Escarpment, "*Extraction is an extremely intrusive use of land, with long-term impacts on natural heritage systems. It is inconceivable that such a destructive activity could take place without a rigorous analysis of demonstrable need for the products that result from the extraction in question" (*Coalition on the Niagara Escarpment,* 2004, p. 4). The PPS 2005 also considers mineral aggregate operations to be "interim" land uses, which is a difficult position to support given their ecologically destructive nature and the extremely long time frame necessary for rehabilitation (see Winfield and Taylor, 2005 for a discussion

of aggregate conservation in Ontario). This is just one example of the imbalance of the policies in the PPS 2005 and it is presented here to illustrate the potential challenges facing planners who undertake to plan for landscape connectivity, given the wording and weighting of the policies.

The NEP was revised in 2005. The revised NEP includes a new statement regarding fragmentation,

> 5. New lots may include the Escarpment Natural or Escarpment Protection Areas designation under the following circumstances:
> a) Correcting conveyances;
> b) Where the land in the Escarpment Natural Area or Escarpment Protection Areas has, or is to be, acquired by a public body or an approved conservation organization; or
> c) Enlarging existing lots provided that ***no further fragmentation*** of the Escarpment Natural or Escarpment Protection Areas would result and provided there is sufficient area in the Urban Area to accommodate the proposed development (p. 28).

This statement protects the Escarpment Natural and Protection Areas from further fragmentation as a result of enlarging existing lots.

Also released in 2005 was the Ontario Biodiversity Strategy, which contains 12 landscape connectivity statements. There are several descriptions of habitat fragmentation and the importance of maintaining natural systems to conserve biodiversity. There are four "Recommended Actions" that feature landscape connectivity, two of which are:

> Recommended Action: 11. Implement the Greenbelt Protection Act and its related greenbelt plan to enhance the conservation of biodiversity by:
> • Generally protecting greenspaces and farmland within the Greenbelt's Protected Countryside area
> • Identifying and protecting a Natural Heritage System, including Key Natural Heritage Features and Key Hydrologic Features
> • Preventing the expansion of settlement areas within the Natural Heritage System and Specialty Crop areas
> • ***Supporting connectivity within the Natural Heritage System and between key features*** (OMNR, 2005, p.30).

> Recommended Action: 24.Work to ***re-establish and/or retain natural linkages and connectivity on the landscape between natural areas,***

> ***including protected areas, with a high priority on reducing landscape-level habitat fragmentation in southern Ontario,*** through the securement of lands by such mechanisms as conservation easements, donation, purchase, protected areas and/or long-term leases (e.g., Great Lakes Conservation Blueprint, Big Picture 2002, Algonquin to Adirondacks, Greenways Strategy, Conservation Authorities and the Ontario Heritage Foundation)(OMNR, 2005, p. 35).

These recommendations support landscape connectivity measures of both provincial initiatives (e.g. the *Greenbelt Act* and the Natural Spaces Program) and non-governmental organizations (e.g. Algonquin to Adirondacks and the Greenways Strategy). Of these recommendations, the *Greenbelt Protection Act* (Action 11) and the Natural Spaces Initiative (Action 25) are identified as Priority Actions for 2005.

However, the Ontario Biodiversity Strategy does not state which ministries are responsible for implementing the 37 recommended actions, nor does it contain timelines for any implementation measures (Environmental Commissioner of Ontario, 2005; Environmental Commissioner of Ontario, 2008). As one commenter stated, in response to the posting of the strategy on the Environmental Registry, "This needs to be corrected by ensuring that this is a *provincial* policy, and not just an MNR policy that can be largely ignored by other ministries" (Environmental Commissioner of Ontario, 2005, p. 70). No new priority actions have been identified since the OBS was released in 2005. Many of the "small steps" that the Government of Ontario has taken involve "off-loading responsibilities to third parties, such a non-governmental organizations or volunteer committees", which constitute a disappointing sidestepping of provincial responsibility for biodiversity (Environmental Commissioner of Ontario, 2008, p. 80). Instead, the Environmental Commissioner of Ontario recommends, "all prescribed ministries develop detailed action plans that specify the measures to conserve biodiversity that they will undertake" (Environmental Commissioner of Ontario, 2008, p. 82).

Another key provincial plan was introduced in 2006. Places to Grow: Growth Plan for the Greater Golden Horseshoe, prepared under the *Places to Grow Act*, is a framework for implementing the Government of Ontario's vision of building stronger, prosperous communities by better managing growth in this region to 2031 (Ministry of Public Infrastructure Renewal, 2006). The vision for the Greater Golden Horseshoe (GGH) includes a "healthy natural environment" in which the "Greenbelt, including significant natural features, such as the Oak Ridges Moraine and the Niagara Escarpment, has been enhanced and protected in perpetuity" to "form the key building blocks of the GGHs natural systems" (Ministry of Public Infrastructure Renewal, 2006). The Plan however contains no specific policies for conserving natural systems, nor does it discuss sustainability or any limits to growth (Environmental Commissioner of Ontario, 2005). The Plan includes only two landscape connectivity statements, one of which simply states that the Designated Greenfield Policy is not meant to provide policy direction for the protection of natural heritage features, areas and systems. The other statement is found in Section 4.2 Policies for Protecting What is Valuable, under Natural Systems, and it states;

> Planning authorities are encouraged to identify natural heritage features and areas that complement, link or enhance natural systems.

This direction imparted by this statement is advisory in nature (planning authorities are "encouraged" to identify links) and does not offer protection for landscape connectivity. This is not surprising, given that the *Places to Grow Act* has been assessed as "poking large holes in the nature conservation agenda" (Wekerle et al., 2007, p.31). The Places to Grow Plan was launched at the same time as the Greenbelt Plan but without the citizen's advisory committee, public consultation, and media attention. By arguing that the Greenbelt Plan and Places to Grow Plan needed to be dealt with and passed at the same time;

> …the provincial government managed to conflagrate two pieces of legislation in the public's mind and, perhaps, dampens the scrutiny and potential opposition to growth from both citizens and municipalities. By linking the Greenbelt Plan, widely perceived as a pro-conservation policy document, with the pro-growth agenda of the Places to Grow Act and its accompanying plan for the Greater Golden Horseshoe, the Provincial government has been able to pacify public concern over the environmental consequences of unchecked growth and justify the need for regional control of planning**,** while ensuring that any discussion of conservation is embedded within the context of inevitable growth (Wekerle et al, 2007, p. 32).

Given this context, it is perhaps a testament to the growing acceptance of the concept of landscape connectivity in Ontario's land use planning that the concept was included at all in the Places to Grow Plan.

In summary, there has been an increase in direction for planners with regards to landscape connectivity in Ontario law and policy between 1970 and 2008. The results of the content analysis support the results of Chapter 4, which show that there has been a movement of theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008. The earliest discussion of the topic was simply mention of the potential of landscape connectivity as a useful environmental planning concept. Over time, the mentions became more frequent. Then the concept moved from background documents into policies and ultimately in some law. However, the legal frameworks are not comprehensive in effect across the entire province and are inconsistent. In general, landscape connectivity is seen as being a positive concept. There is scant attention paid to the possibility that landscape connectivity may not be desirable in all cases. Accordingly, not all policies and laws provide a mechanism for landscape connectivity to be assessed on an individual case study basis, which would ensure that it is a desirable activity in that circumstance.

5.5 Conclusion

The main question of this chapter's content analysis is, "How does Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity?" The concept of landscape connectivity was found in half of the land use planning documents examined. The content analysis demonstrates that Ontario's land use planning law and policy often does not provide explicit direction to planners in many cases and in many circumstances. It does provide some direction and thus the answer to the main question is "Indirectly". The majority of the landscape connectivity statements was neutral and thus conveyed no direction to planners. A third of the statements were advisory and only a very small number were positive or imperative. The concept of landscape connectivity itself was portrayed largely as a neutral or positive concept.

In reading the documents that apply to landscape connectivity on private or patent land, it becomes apparent that, although planners in Ontario are expected to plan for landscape connectivity, the details of how exactly they should do so remain unclear. Detailed technical guidance is provided by the supporting documents, but the use of these documents is discretionary. Some planning authorities may choose not to refer to the Natural Heritage Reference Manual or the Significant Wildlife Habitat Technical Guide. Some planning authorities may wish to follow the recommendations of the Natural Heritage Reference Manual or the Significant Wildlife Habitat Technical Guide but do not have the financial resources or skilled personnel required needed to do so. Therefore, the application of landscape connectivity will vary considerably.

This is particularly problematic because, following the 1996 changes to the *Planning Act* that brought in a "One Window" planning service and Municipal Plan Review, planning applications which involve natural heritage protection on patent land are no longer required to be circulated to the Ministry of Natural Resources and

Conservation Authorities. Instead, municipalities are responsible for their own technical reviews of planning applications and they may not have the "in house" expertise necessary for an adequate review (Diamond et al., 2002). Municipalities may make decisions that do not comply with provincial policy, and decisions by the provincial government to appeal to the OMB are no longer made by the MNR, which has a mandate to protect natural heritage, but by the MMAH (Diamond et al., 2002). Given that the application of landscape connectivity, 1) requires specialized training; 2) must be considered at a landscape or regional level; and, 3) is often expensive; it would seem that making municipalities responsible for decision-making will lead to a lack of consistency of application of landscape connectivity at the municipal level, which will in turn affect landscape connectivity at the provincial level.

The major documents currently applicable to land use planning in Ontario on private or patent land, namely the *Planning Act*, Provincial Policy Statement 2005, *Greenbelt Act* and Plan, *Oak Ridges Moraine Conservation Act* and Plan, and *Niagara Escarpment Planning and Development Act* and Niagara Escarpment Plan all recognize the importance of natural heritage and all offer some level of protection to natural heritage systems and natural heritage features. It is thus fitting that they also recognize the concept of landscape connectivity and include planning for landscape connectivity in their policies. However, competing land uses are permitted in almost all of these natural heritage and linkage areas. Other land uses, such as agriculture and mineral extraction activities, trump natural heritage and thereby decrease the level of protection that natural heritage systems might otherwise receive. Notably, infrastructure is not included in the PPS 2005's definition of development. The Environmental Commissioner of Ontario cited the exemption of infrastructure from the environmental restrictions of the PPS as a major flaw in Ontario's planning system. Commissioner Gord Miller stated, "Highway projects, in particular, can have severe environmental

impacts. Moving vast quantities of earth and aggregates with heavy machinery can damage streams and wetlands, block wildlife migration corridors, and break up ecosystems." (ECO, 2005, News release November 1).

The 10-year reviews of the Greenbelt Plan, ORMCP and NEP will be coordinated in 2015. This should lead to better consistency in terms of policy, but not necessarily better protection for natural heritage or landscape connectivity. The Greenbelt Plan contains policies that are weaker than those of the ORMCP and NEP in terms of protecting natural heritage systems and features. The Greenbelt Plan also prevents municipalities from adopting official plans and zoning by-laws with more restrictive policies on agricultural land protection and mineral aggregate extraction than those of the Greenbelt Plan. If, at the time of review, the ORMCP and NEP coordinate their policies with those of the Greenbelt Plan, there may be a weakening of natural heritage and environmental protection in Ontario. In addition, the PPS 2005, Greenbelt Plan, ORMCP and NEP all allow boundary changes therefore whatever environmental protection they offer cannot truly be considered permanent, despite wording to the contrary. These policies also lack specific environmental protection status and targets, thus making it difficult to monitor progress and evaluate the success of the policies at achieving their environmental protection objectives.

The above section focuses on how Ontario's land use planning law and policy direct planners to apply the concept of landscape connectivity on private or patent land, which constitutes 13% of the province's land area. The remaining 87% of the province consists of Crown Land in Northern Ontario. As noted in Chapter 4, there is no comprehensive land use planning process for the north and the *Public Lands Act*, currently the only tool to guide planning in the north, provides the Ministry of Natural Resources with little direction or authority for land use planning. The *Public Lands Act* does not address any ecosystem goals and so it is not surprising that the concept of

landscape connectivity is absent from the document. Of the total 48 documents analyzed for this content analysis, only five provide any direction for landscape connectivity on Crown Land: Ontario Provincial Parks: Planning and Management Policies (1978, 1992), Nature's Best (1997), and the OLL Strategy (1999), and the direction provided is minimal. For example, there is little direction found in the OLL Strategy with regard to planning for landscape connectivity, despite the fact that its planning areas covers over half of the province.

Chapters 4 and 5 have shown that the theory of landscape connectivity is included in many of Ontario's land use planning policies and legislation and that there now exists the expectation that Ontario planners should plan for connectivity. The following chapter examines the manner in which the landscape connectivity provisions of relevant legislation and policies were interpreted and applied by the Ontario Municipal Board (OMB).

6 The Application of Landscape Connectivity Policy by the Ontario Municipal Board

6.1 Introduction

This chapter 6 presents an analysis of the manner in which the landscape connectivity provisions of relevant legislation and policies were interpreted and applied by the Ontario Municipal Board (OMB). A summary of relevant cases before the OMB will be presented and analyzed.

6.2 Natural Heritage Decision Making by the Ontario Municipal Board

The Ontario Municipal Board (OMB) is an independent adjudicative tribunal that is responsible for settling disputes over land use planning and other municipal issues. Municipal planning is critical to protecting natural heritage in Ontario because it exerts major control over future land uses on private land (MMAH, 1995). The OMB hears appeals and applications on land use planning under the *Planning Act* and other legislation. The OMB is responsible for interpreting and applying policies and legislation that concern natural heritage issues and thus OMB decisions have important consequences for natural heritage protection in Ontario in the parts of the province that are privately owned.

Wilkinson, in an analysis of the application of the Natural Heritage Section of the PPS by the OMB between the years 1997 and 2000, concluded that the Natural Heritage Section was "generally applied in a thoughtful and effective manner by most Ontario Municipal Board members" (Wilkinson, 2002, p. 159). Among his findings, however, he noted that the involvement of government agencies in front of the board was minimal and their lack of direct involvement in the planning process was

sometimes a factor cited by OMB members who ruled against natural heritage protection. Wilkinson also found that a significant variable in the application of the Natural Heritage Section was the presiding OMB member.

Ontario Nature expanded upon Wilkinson's analysis of 19 OMB decisions and presented a review of 71 cases with significant natural heritage issues that were decided by the OMB between May 1996 and July 2003. That report gave support to the noted "widespread dissatisfaction with OMB decisions in the naturalist community" as it revealed that defenders of natural heritage had a 30% success rate while developers had a 70% success rate in winning the appeal (Ontario Nature, 2003, p. 7). The report suggests a number of factors involved in this poor success rate, including:

- Weakness of OMB support and guidance for potential appellants;
- Weakness in cases presented by natural heritage defenders;
- Imbalance in resources between defenders of natural heritage and development interests;
- Lack of clarity in the PPS with respect to natural heritage, and whether or not decisions must be consistent with provincial policy;
- Inability of some Official Plans to adequately protect natural heritage
- Variation in understanding and attitude toward natural heritage among OMB hearing officers; and,
- Too many cases proceed to the OMB before proper municipal review, thus the resources of natural heritage defenders are "spread too thin".

In a report to the Environmental Commissioner of Ontario (ECO), Meyfarth O'Hara (2008) examined the manner in which the natural heritage provisions of the 2005 PPS under the *Planning Act* were interpreted and applied by the OMB between January 2004 and January 2008, in addition to how other relevant environmental legislation was considered, such as the *Oak Ridges Moraine Conservation Act* and the

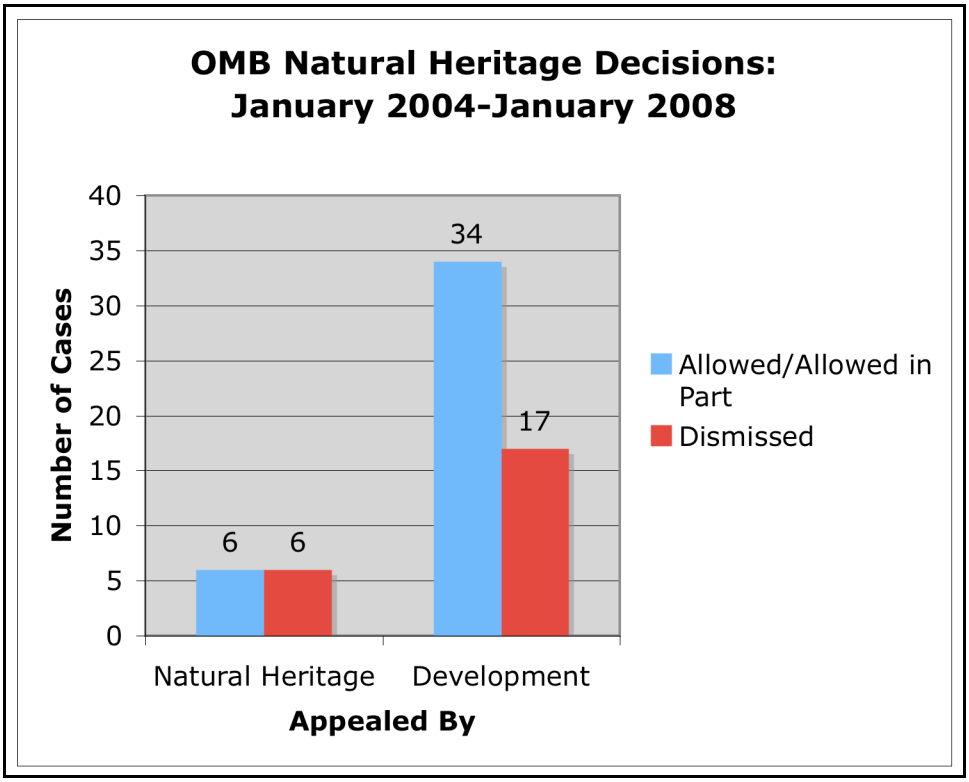
Greenbelt Act. The goal of the report was to provide the ECO with an understanding of how planning reforms are affecting decision-making on natural heritage protection at the OMB. A new PPS was implemented on March 1, 2005, replacing the previous PPS (1996, amended 1997). Section 3 of the Planning Act was amended to require that all decisions affecting land use planning matters "shall be consistent with" the Provincial Policy Statement, whereas previously planners were required to "have regard to" the Provincial Policy Statement. "Shall be consistent with" is seen by many as a stronger test than "have regard to" and is thus intended to be a higher policy implementation standard. For example, the Ministry of Municipal Affairs and Housing stated;

> Viewed in comparison to the previous implementation standard of "shall have regard to," "shall be consistent with" is a higher policy implementation standard and is a more demanding test. It requires decision-makers to apply the policies and make decisions that are consistent with the applicable policies of the PPS. It is a strong implementation standard focusing on achieving policy outcomes, but it retains some flexibility for implementation (MMAH 2005, 3).

The report for the ECO examined whether this new standard had improved clarity and consistency of the OMB's natural heritage decisions.

Meyfarth O'Hara (2008) reviewed 63 OMB decisions. Of the 63 appeals, 51 were pro-development and 12 were pro-natural heritage (see Figure 6.1). Of the 51 appeals launched by development, 21 were allowed, 13 were allowed in part and 17 were dismissed. Of the 12 appeals launched in defense of natural heritage, 3 were allowed, 3 were allowed in part and 6 were dismissed.

Figure 6.1 OMB Natural Heritage Decisions



It is interesting to note that while the percentage of pro-natural heritage appeals with successful outcomes increased to 50% in this study covering the 2004-2008 period, as opposed to 30% in the Ontario Nature study covering the 1996-2003 period (see Figure 6.2), the percentage of appeals being launched by natural heritage defenders decreased to just 19%, as opposed to 32% in the Ontario Nature study (see Figure 6.3).

Figure 6.2 Natural Heritage Appeal Success Rates

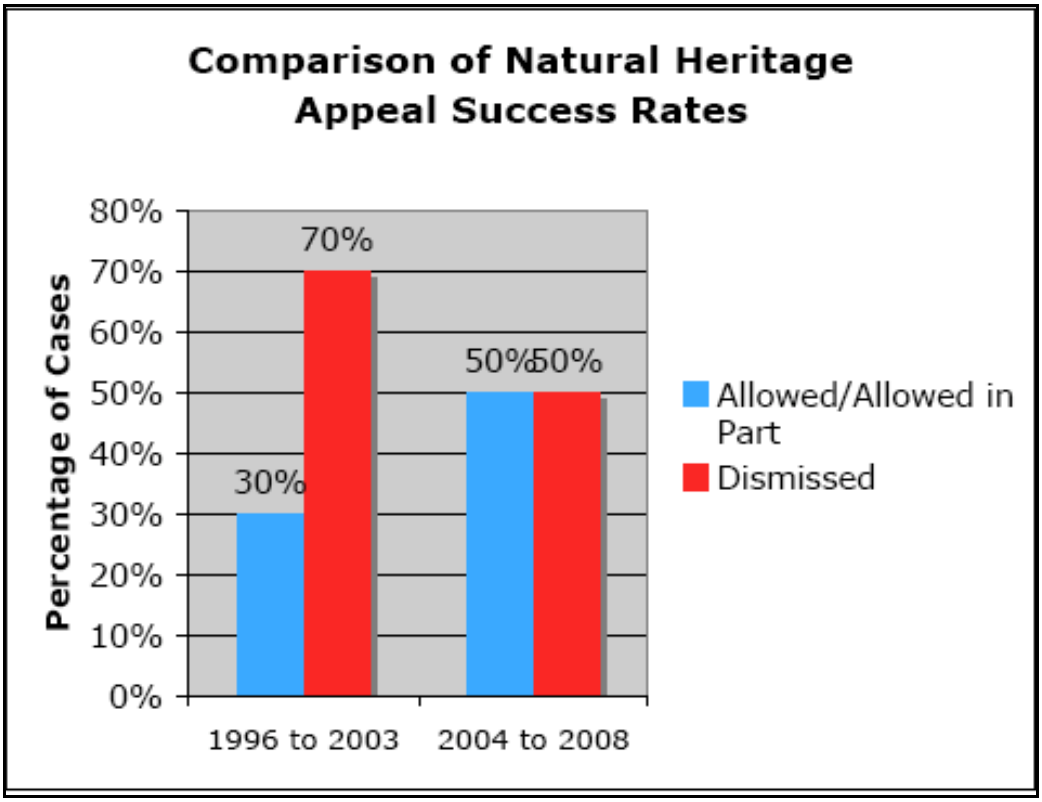
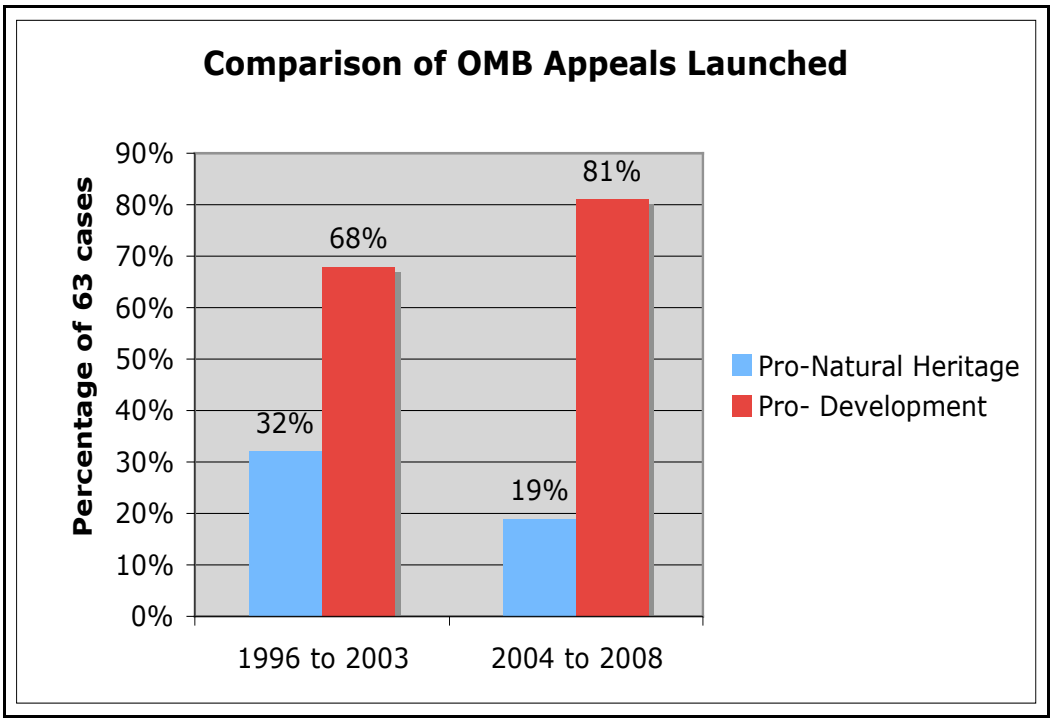


Figure 6.3 Comparison of OMB Appeals Launched



This database of 63 cases was further refined to include only those cases with a significant discussion of the PPS 2005 and/or other relevant environmental policies and legislation. Fifteen cases were selected for more detailed analysis including an assessment of the OMB's interpretation and application of natural heritage policies. Following the format of Wilkinson's 2002 study, "successful" was used to denote the effective use of the policy in relation to the final ruling; "neutral" was used to denote that the policy was not a central issue in the case; and, "unsuccessful" was used to denote that the policy was not used effectively in relation to the final ruling. Wilkinson noted that effectiveness, in this context, denotes the application of the policy in some form within the ruling (Wilkinson, 2002).

Of the 15 OMB cases selected for more detailed analysis, natural heritage policies were successfully interpreted and applied in 12 of those cases. For example, in Decision Number 2536 (September 17, 2007), Board Member Granger dismissed a development appeal against an Environmentally Sensitive Landscape designation proposed by the Region of Waterloo. Regional Official Policies Plan Amendment 22 (ROPPA 22) is intended to assist the Region of Waterloo in identifying areas of concentration of high quality natural areas for long-term protection from any other development than continuing agriculture. The land use planner for the appellants argued that it was "unfair to prejudge today what might potentially be appropriate in 20 or 30 years". Granger, however, supported the "environmental step forward" represented by ROPPA 22 and stated, "ROPPA 22 represents an advanced planning approach to recognizing, maintaining or improving landscape connectivity and ecological functions in areas of the region noted for their concentrations of high quality natural areas". Granger also noted that;

> The land use planner for the Region is of the opinion that ROPPA 22 is consistent with the PPS, noting the importance of natural features being protected for the long term and the maintaining, restoring or where possible, improving diversity and connectivity of ecological function and biodiversity of natural heritage systems for the long term as set out in PPS policies 2.1.1 and 2.1.2. His evidence and opinion regarding the PPS was not contradicted by any other evidence.

This case highlights a successful interpretation of the Natural Heritage Section of the PPS and a willingness of the Board to accept "advanced" planning approaches to protecting natural heritage, including recognizing, maintaining or improving landscape connectivity.

Another successful example was found in Decision Number 3289 (November 23, 2006), in which the *Greenbelt Act* and Plan and the *Oak Ridges Moraine Conservation Act* and Plan were acknowledged by Board Members Eger and Gates in their decision. They noted that, "The Province's aggressiveness in enacting the *Oak Ridges Moraine Act, 2001* and the *Greenbelt Act, 2005* and their regulations appears to have substantially changed the positions of the parties such that many of the once disputed areas are now protected by one or other of these respective plans." They allowed the development appeals, to expand the urban boundary of the Town of Richmond Hill, in part, applauding the "Environment First" principle of the proposed Secondary Plan for North Leslie. Board Members Eger and Gates stated;

> In considering an OP for the last large greenfield parcel of land in Richmond Hill, the Board was looking for a grand vision. Largely through the policy direction of the Province, and the prodding of the Town and other public agencies, and the ultimate acceptance by the landowners, this grand vision was realized by anchoring the plan for North Leslie on a comprehensive natural heritage system. This system, consisting of approximately 30% of the land under review, includes many north-south nature and trail linkages centered on the three tributaries of the Rouge, the Greenbelt, provincially identified environmentally significant features and areas of scientific interest, the southerly edge of the Oak Ridges Moraine, and an east-west surface linkage through a pipeline easement. Both the landowners and the public agencies are to be congratulated for their spectacular yet sensitive vision for North Leslie.

Meyfarth O'Hara's review deemed this to be a successful interpretation of the Greenbelt and Oak Ridges Moraine natural heritage policies. The Board found that the proposed Secondary Plan "provides for the establishment of a NHS that appropriately recognizes all significant environmental lands and provides for a regional scale corridor connecting the ORM with the Rouge Watershed through the North Leslie lands as envisioned in provincial policy documents." For the purposes of this dissertation, this case also supports the idea of the importance of ecological linkages and confirms that landscape connectivity is indeed present in Ontario's provincial policy and a planning consideration before the OMB.

An unsuccessful application was found in File Number PL980499, PL060924 (January 16, 2008), which involved a wetland and a proposed subdivision. The Applicant "contravened the previously agreed upon direction of the Board… by clearing and grading land and in the building of a road across the wetland in dispute." Despite this, Board Member Culham allowed the development appeals in part. Culham stated:

> The Board concludes that the actions of the Applicant undermine the trust that the Township, the County, and the population at large may hold in the ability of the Board in fairly managing events once the matter is before it. This Board does not accept that in providing the judicial framework, the Court expected the Board to ignore or pretend that such an egregious action did not occur. They occurred; they damaged the wetland; the Applicant acted wrongly. In considering a remedy, the Board accepts the limitations established by the Courts. The Board takes no further action."

Such a ruling not only undermines trust in the OMB, as stated above, it also undermines the natural heritage section of the PPS and could be interpreted as giving a green light for developers to pave first and make excuses later, with little fear of serious reprisal. It also reveals a major legislative flaw in the Planning legislation and policy. There is no penalty that can be assessed if a private land owner damages or

destroys a natural heritage feature designated under the Planning Act.

In general, however, Board Members gave appropriate weight to natural heritage concerns and attempted to balance natural heritage with other provincial concerns in a manner consistent with the PPS. This is consistent with Wilkinson's 2002 study, which concluded that the natural heritage policies of the PPS 1997 were generally applied in a thoughtful and effective manner by the OMB. It is important to note, however, that the successful application of the policy does not automatically result in a successful appeal for natural heritage defenders. For example, in Decision Number 1488 (May 18, 2006), Board Members Jackson and O'Connor gave a very thorough and detailed review of the natural heritage issues involved in a proposed residential development. In many instances, they preferred the testimony of the pro-natural heritage witnesses and they concluded that the subject lands met the criteria for Significant Wildlife Stop Over Habitat for land migratory birds but, ultimately, the development appeals were allowed in part. Jackson and O'Connor added the following statement to their decision:

> The Board also wishes to be reflective of the views of most of the planning witnesses and the public that the best use of this site is as a public park. In the time available before the Board's final Order is issued, now that numbers of units and the perimeters of the development are better known, the Board directs the Town of Oakville to consider whether the Town of Oakville will make a final offer to purchase or to expropriate all of the Palm Place property.

This ruling demonstrates that although the Board agreed that the best use of the site was as a public park, the PPS dictated that they must allow the development to go forward.

At issue in both Wilkinson's and Meyfarth O'Hara's reviews was the wording of the PPS. Planning decision makers "shall be consistent with" the PPS 2005, whereas they were previously required to "have regard to" the PPS 1997. As argued by Wilkinson (2002), the looser phrasing of "have regard to" served to impair the

effectiveness of the Natural Heritage Section of the PPS 1997 as it was frequently interpreted as being non-binding. Likewise, a participant in a 2004 OMB appeal likened the PPS to the Bible in that its statements are subject to interpretation (see Decision Number 0814 in Appendix C). The new wording, "shall be consistent with", is seen as a stronger test than "have regard to" and is thus intended to be a higher policy implementation standard.

Although the PPS 2005 had been in place for three years at the time of Meyfarth O'Hara's review, there were very few OMB cases that focused on the natural heritage policies of the "new" PPS. Of the 63 cases reviewed, only 10 discussed the natural heritage policies of the PPS 2005. This in itself may reveal a lack of need to appeal to the OMB since the PPS natural heritage policies are being appropriately applied, as viewed by most observers. In most of these cases, the natural heritage policies were applied successfully. While it is encouraging to note that the OMB appears to be applying natural heritage policies effectively, the number of cases involving natural heritage was simply too low to draw firm conclusions as to how the new policies are playing out in this aspect of Ontario's municipal planning system.

6.3 Landscape Connectivity Decision Making by the OMB

The above review suggests that natural heritage policies are, in general, being applied in an appropriate manner by the OMB. This section next will take a closer look at how the landscape connectivity provisions of relevant legislation and policies were interpreted and applied in cases before the OMB between January 2001 and January 2008.

6.3.1 Method of Analysis

A sampling of OMB cases was selected using a series of keyword searches in the OMB E-Decisions database for cases between January 2001 and January 2008 (Note: 2001 is the earliest date available in the database). The keyword search terms were:

> Connectivity AND natural heritage, landscape connectivity, corridor AND natural heritage, linkage AND natural heritage, natural connection, greenway

This sampling method is reliable as it can be repeated and, if limited by the same time frame, would produce the same results.

The initial search produced 80 potential cases. These cases were read in their entirety in order to determine relevancy. Cases were deemed irrelevant to the search if they did not make reference to landscape connectivity. Also excluded were preliminary rulings, pre-hearing conference memos, mediated decisions, settlement decisions, and motions for costs. Thirty-six OMB cases remained for analysis.

In keeping with the prior analyses by Wilkinson (2002) and Meyfarth O'Hara (2008), the cases were summarized in a standard format to facilitate a comparative analysis (see Appendix C). Information presented in the summaries include an overview of the case, landscape connectivity terms used, positions of parties, useful quotations or comments, government agency participation, landscape connectivity policies, and legislation applied in the case, and the Board's decision. As noted in Chapter 1, this dissertation does not approach the problem of the theory-practice gap in landscape connectivity in simple terms of whether or not the theory of landscape connectivity is being applied correctly because, as yet, there is no one 'correct' and proven method of implementing the theory. Instead, it is more useful to ask *how* the theory of landscape connectivity is being applied in land use planning and thus, each summary concludes with the interpretation and application of landscape connectivity

policies, including whether landscape connectivity was a deciding factor in the case.

6.3.2 Analysis

The numerical results will be presented first, followed by more detailed analysis. Landscape connectivity was a deciding factor in 27 of the 36 OMB cases. In the remaining nine cases, landscape connectivity was mentioned or discussed in the case review but was not identified as a factor in the Board's decision. In 20 of the 27 cases where landscape connectivity was a deciding factor, the Board ruled in favour of protecting landscape connectivity. For example, Decision Number 1411 (May 17, 2007) involved a proposal to develop a vacant parcel of land situated in the west end of the Town of Ajax (Town) with 29 residential estate lots. The Town and the Toronto Region Conservation Authority (TRCA) were opposed to development of the site and took the position that it should be preserved and designated under the Town's Official Plan (Town's OP) as Environmental Protection. The TRCA argued that the site as a whole provided value given the significant forest cover and habitat for rare and endangered species, regionally rare species, species of concern, and connectivity between river and creek systems to the south and north. Board Member Seaborn agreed with this ecosystem approach and identified connectivity as a key factor in the Board's ultimate ruling. Seaborn stated;

> Based on the totality of the environmental evidence and with a view to considering the policies at both the provincial and municipal levels that espouse the need for balancing protection with development, the Board concludes that the third plateau (closest to Urfe Creek) is not appropriate for residential development and should accordingly form part of the EP designation proposed for Urfe Creek. In arriving at this conclusion, the Board has considered the impact assessment undertaken by Jizoco and balanced this assessment against the opinions of experts from the TRCA and those retained by the Town. Development of the third plateau has the greatest potential to affect corridor and linkage functions of the valley walls and floodplain of Urfe Creek. In this regard, the Board accepts that Urfe Creek represents a large habitat block that connects two Environmentally

> Significant Areas to the south and the north. The introduction of residential houses on the third plateau, in such close proximity to the Urfe Creek and its associated valleylands, has the potential to compromise this connectivity.

Seaborn thus identified connectivity as the reason for not allowing residential development. Seaborn identified Policy 2.3.3 of the PPS, which provides that the diversity of natural features in an area and the natural connections between them should be maintained and improved where possible, as being of particular relevance to the case. The final ruling, as presented above, upholds the intent of the PPS's landscape connectivity policy.

The Board ruled in favour of protecting landscape connectivity in the majority of the cases analyzed. The provincial policies, legislation and supporting documents used to support landscape connectivity in the cases included the PPS 1997, PPS 2005, the *Oak Ridges Moraine Conservation Act*, the Oak Ridges Moraine Conservation Plan, the Niagara Escarpment Plan, the Greenbelt Plan, the *Conservation Authorities Act*, and the Natural Heritage Reference Manual.

The PPS 1997 was used most frequently to support landscape connectivity. The Board ruled in favour of protecting landscape connectivity in 15 of the 20 cases which identified the PPS 1997 as being relevant to landscape connectivity. For example, Decision Number 0513 (May 7, 2002) involved a proposal to approve a Secondary Plan for the development of Snow Valley, on a 1700-hectare site west of the City of Barrie in the Township of Springwater. The primary issues in the Board hearing were based on potential impacts to natural heritage and agriculture from development areas proposed for the uplands portion of the Secondary Plan. The County of Simcoe argued that the Secondary Plan did not adequately consider development impacts on significant woodlands, significant valleylands and significant wildlife habitat. One of the County's concerns was for adequate consideration for wildlife corridors. The key

provincial policies identified by Board Member Daly as being at issue for the hearing were under Section 2.3 Natural Heritage of the PPS 1997. With regards to landscape connectivity, Daly stated, "Policy 2.3.3 demands an investigation of the diversity of features in an area and the connectivity or linkage between features. They are to be maintained and where possible improved". Thus, the Board identified the PPS 1997's landscape connectivity policy as being central to the hearing. This case, along with the 14 others that supported landscape connectivity, suggests that the OMB was indeed "having regard to" Policy 2.3.3 in their case reviews and decision-making.

The PPS 2005, for which the stronger policy standard of "shall be consistent with" now applies, was identified in seven cases. The Board ruled in favour of protecting landscape connectivity in five of these cases. Only one of these cases specifically cited Policy 2.1.2, which states;

> The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

The Board ruled in favour of protecting landscape connectivity in this case, Decision Number 2536 (September 17, 2007). Board Member Granger found that the evidence and opinion of the land use planner who cited Policy 2.1.2 in support of the plan amendment at issue "was not contradicted by any other evidence" and further stated that the plan amendment represented "an advanced planning approach to recognizing, maintaining or improving landscape connectivity and ecological functions". Although in this one case the OMB is clearly being "consistent with" Policy 2.1.2, the number of cases involving the PPS 2005 is too low to draw firm conclusions as to how this new landscape connectivity policy is being applied by the OMB.

The Board ruled in favour of protecting landscape connectivity in both of the cases involving the *Oak Ridges Moraine Conservation Act* and Plan. For example,

Decision Number 1222 (September 15, 2003) involved a proposal to change the zoning for a property located in the Oak Ridges Moraine in order to permit a private boarding and kennel facility for dogs. The primary issue in the hearing was conformity with the *Oak Ridges Moraine Act* and the Oak Ridges Moraine Conservation Plan. This hearing was one of the first times that the OMB reviewed an appeal which had to conform to this new legislation. The subject property was located in a Natural Core Area. With regard to landscape connectivity, Section 11(1) of the Oak Ridges Moraine Conservation Plan states that the purpose of Natural Core Areas is to maintain and, where possible, improve or restore the ecological integrity of the Plan Area by;

> Maintaining and, where possible, improving or restoring the health, diversity, size and connectivity of key natural heritage features, hydrologically sensitive features and the related ecological functions.

Board Member Jackson acknowledged that accessory uses under Section 11 of the Oak Ridges Moraine Conservation Plan, such as home businesses and home industries, may be required under Section 20 to prove that planning, design and construction practices "ensure that no buildings or other site alterations impede the movement of plants and animals among key natural heritage features, hydrologically sensitive features and adjacent land within Natural Core Areas". Thus the proposal for the kennel was required to prove that it would not impede connectivity. Ultimately, Board Member Jackson was not satisfied that the analysis prepared by the proponent had "done more than to consider the subject property when the analysis ought to consider the context of the Plan Area with specific reference to the natural features that surround the subject property". The failure to consider the subject property's relationship to surrounding features was cited as one of the reasons that Board Member Jackson found that the proposal did not conform to the Oak Ridges Moraine Conservation Plan and, thus, the appeal was dismissed. This decision is important to

landscape connectivity specifically, and natural heritage in general, as it demonstrates that the Board was willing, when warranted, to look beyond the boundaries of the property at issue and consider the ecological impacts that development might have on the surrounding area, including potential impacts on wildlife and plant movement.

The Board ruled in favour of protecting landscape connectivity in all three of the cases involving the Greenbelt Plan. For example, Decision Number 1794 (June 22, 2006) involved a proposal for severance and development of three lots backing onto Bronte Creek valley land. The primary issue before the Board was whether or not dedication of the entire 15-metre setback area should be required as a condition of severing the existing property, and, if not, what portion, if any, should be required to be dedicated and how should any non-dedicated land in the setback area be protected. Board Member Pendergrast acknowledged that Bronte Creek was indeed a significant linkage, stating;

> The Board notes at the outset that the Bronte Creek valley is a major river valley and a significant natural feature, and is identified as such in the Greenbelt Plan and the Regional and Local Official Plans. As stated in the comments of Conservation Halton on the applications, "Bronte Creek provides an important ecological linkage between Bronte Creek Provincial Park and Lake Ontario. The (Greenbelt) Plan states that the river valleys that run through existing urban areas and connect the Greenbelt to the Great Lakes are a key component of the long-term health of the Natural System." (Tab 4, Exhibit 2a, page 51)**.** Given its significance, the question of how best to protect the valleyland adjacent to 256 Bronte Road and the 15-metre setback area intended to protect the stability of the valley slope and to buffer it from nearby development is clearly an important one.

This statement supports the significance of the Bronte Creek valley as an ecological linkage and the significance of the Greenbelt Plan to the case. The Greenbelt Plan was successfully used to establish the importance of maintaining the connectivity of Bronte Creek.

In both of the cases involving the *Niagara Escarpment Development and Planning Act* and the Niagara Escarpment Plan, however, the Board ruled against

protecting landscape connectivity. For example, Decision Number 1678 (October 21, 2004) involved an appeal for a proposed Official Plan amendment for the Town of the Blue Mountains. The amendment would allow for a large resort development on a 620-hectare property. The subject lands were designated "Escarpment Recreation" under the Niagara Escarpment Plan, which permitted resort development. At issue in this hearing was a portion of the proposal related to the "non-deferred" lands below the brow of the Escarpment. The opponents contended that it was inappropriate to proceed with any development on the non-deferred lands until all studies had been completed on the deferred lands above the brow of the Escarpment. Specifically, they felt that there had been insufficient study to show that there were no "essential connections" between the deferred lands above the brow and the non-deferred land below the brow of the Escarpment. They argued that, 1) the subject property must be considered in the context of the natural features and functions of surrounding lands; and 2) by deferring the study of the lands above the brow of the Escarpment, the possibility of essential connections between those lands and the lands below the brow was being ignored. They further argued that there was an incomplete understanding at the Official Plan level of the natural features and functions, such as landscape connectivity, of the subject lands.

Board Member Stockton disagreed with this argument and concluded that the issue of connectivity had been adequately addressed. Stockton found that the Official Plan amendment conformed to senior planning documents, namely the Niagara Escarpment Plan and the *Niagara Escarpment Planning and Development Act* and also had "due regard for Section 2.3 of the PPS". Stockton described the proposed development as maintaining "a proper balance between protection of the Province's natural heritage, and its economic future". The wording of Stockton's decision,

however, seemed weighted in favour of developing a region described as "key to the economic development of the Province".

In contrast to this "balance" in favour of economic development, the Board Member in Decision Number 0247 (January 24, 2006) concluded that "any 'balance' in a planning context should be resolved in favour of the environment and the preservation of ecological function". The case involved a proposal to develop seven single residential homes in the City of Etobicoke. The Toronto and Region Conservation Authority (TRCA) opposed the development because the "construction impacts and additional permanent urban intrusion into the valley corridor would cause irreversible harm to the natural heritage system". The TRCA argued that;

> The cumulative impacts negatively impact the function of the ecological corridor and as such, the 'conservation of land,' as per the Conservation Authorities Act as implemented by Ontario Regulation 158. … the Ontario Court of Justice has previously upheld the Conservation Authority's ability to consider "the conservation of an ecosystem" as comprehended in the words "conservation of land" when approving or refusing a permit application under Ontario Regulation 158 (in *611428 Ontario Limited* v. *Metropolitan Toronto and Region Conservation Authority*, April 22, 1996).

Board Member Rossi accepted the TRCA's position that the proposed development was incompatible for ecological reasons, including connectivity, and dismissed the development appeals. Thus the *Conservation Authorities Act* was successfully used in an argument before the OMB to protect an ecological corridor.

The Natural Heritage Reference Manual was used to support landscape connectivity in six cases before the OMB. The Board ruled in favour of protecting landscape connectivity in four of those cases and against protecting landscape connectivity in two cases. The use of the Natural Heritage Reference Manual was no guarantee of success. For example, much of the debate on environmental issues in Decision Number1678 centered on the use of the Natural Heritage Reference Manual. All of the witnesses agreed that the Natural Heritage Reference Manual's Natural

Heritage System approach represented one method of giving effect to Section 2.3 of the PPS. Part of this approach included "identification of areas requiring protection to maintain diversity and connectivity between natural heritage features". However, Board Member Stockton cautioned;

> While the use of the Natural Heritage Reference Manual appears to be widespread in environmental planning, it is important to remember that the Manual does not represent a policy document for planning purposes, nor is the use of a natural heritage system mandated.

This statement reflects the discretionary status of the Natural Heritage Reference Manual. Although the Natural Heritage Reference Manual is meant to provide technical guidance, its use is not mandatory and the OMB is able, and this case quite willing, to accept approaches other than the Natural Heritage System approach.

The most obvious issue revealed by the comparative analysis was the wide range of terms used by Board Members and OMB participants to describe landscape connectivity (see Table 6.1).

Table 6.1 Landscape Connectivity Terms used in OMB Cases from January 2001 to January 2008

connection	connectivity of ecological functions
connectivity	contiguous valley corridor
continuous corridor system	corridor of natural lands
corridor linkage	ecological corridor
corridor	fragmentation
ecosystem linkage	greenbelt
functional connectivity	greenway links
greenland linkage	greenway
greenway system	habitat fragmentation
habitat connection	hydrological connection
hydrogeological connection	landscape connection
land fragmentation	linkage
landscape connectivity	local scale connecting corridor
linked natural heritage/open space system	natural connection
migration corridor	natural heritage connection
natural corridor	natural heritage system corridor
natural heritage corridor	natural linkage corridor
natural linkage area	natural open space corridor
natural linkage	naturalized corridor
natural swale area linkage	open space linkage
nature linkage	park link
optional linkage preserve area	regional scale corridor
physical connection	river corridor
riparian corridor	significant corridor
river valley connection	surface linkage
significant linkage	trail linkage
surface water linkage	wildlife corridor linkage
valley corridor	wildlife movement corridor
wildlife corridor	

Unless properly defined, the plethora of terms shown in Table 6.1 may lead to confusion, which, in turn, may influence the Board's decisions. For example, in Decision Number 0166 (February 1, 2001), Board Member Rosenberg appears to have used landscape connectivity terms inappropriately. The case involved a development proposal to build two apartment buildings on a vacant parcel of land owned by the applicant in the City of London. Planners for the opposition argued that the application did not adhere to Policy 2.3.3 of the PPS 1997 as development on the site "would result in a loss of physical and natural features on the site and increase the distance and

physical barrier or separation with the natural features of Springbank Park by perpetrating the loss of corridor functions". An ecologist gave evidence in opposition to the proposed rezoning and stated that the proposed development would result in a net negative impact on ecological features and functions, including "effect on the corridor function provided by the woodland communities". A forester also gave evidence in opposition to the proposed rezoning and stated that the subject property "is an important linkage to Reservoir Hill and Springbank Park". He voiced concern over fragmentation if remaining patches were eliminated.

Despite the evidence presented to support the significance of the linkages, Rosenberg ruled that high-density residential housing was "very appropriate and desirable" for the site. With regards to landscape connectivity, Rosenberg stated that,

> … park links and open space linkage will still be maintained in Reservoir Hill and Springbank Park. The main linkage for wildlife is in an east-west direction on Springbank Park. There is no shortage of open space in this area of the City of London. Ecological features of the two parks are still protected.

In this statement, Rosenberg used the terms "park links", "open space" and "wildlife linkages" interchangeably. These terms are not equivalent to each other. For example, open space is not the same as a wildlife linkage, though some species may be able to move through open space from one habitat patch to another. The incorrect usage of landscape connectivity terms raises the possibility that Board Member Rosenberg may have been confused by the terminology, which may, in turn, have affected the final ruling. Rosenberg allowed the development appeals in part and gave approval for the development of one apartment building on the site. Rosenberg found that there was "no significant linkage to Springbank Park" and "linkage to Reservoir Hill will still be maintained". Rosenberg concluded that Section 2.3.1 of the PPS had been "adequately addressed" but made no specific mention of Section 2.3.3 despite it having been raised as relevant by the opposition.

The comparative analysis revealed several approaches to planning for landscape connectivity. These were identified in the OMB written decisions as the "precautionary approach", the "ecosystem approach", and the "Natural Heritage System approach". The approaches met with varying degrees of success before the OMB.

Decision Number 1678 featured the use of the precautionary approach. As discussed earlier, the case involved an appeal for a proposed Official Plan amendment for the Town of the Blue Mountains which would allow for a large resort development on a 620-hectare property. The Allied Parties (appellants) and the Ratepayers (opponents) had a fundamental disagreement on the planning approach to be taken with respect to natural heritage issues. The Allied Parties preferred what they described as a "drilling down" approach in which, at each stage of development, the required environment studies would become more and more specific. The Ratepayers preferred what they described as a "precautionary" or "environment-first" approach in which a greater level of study would happen prior to determining appropriate land use designations. The Ratepayers contended that it was inappropriate to proceed with any development on the non-deferred lands until all studies had been completed on the deferred lands above the brow of the Escarpment. Specifically, they felt that there had been insufficient study to show that there were no "essential connections" between the deferred lands above the brow and the non-deferred land below the brow of the Escarpment. As described by the Board;

> Board Member Stockton disagreed with the Ratepayers' argument and concluded that the issue of connectivity had been adequately addressed. Again, the Board accepts the evidence of the expert witnesses for Castle Glen that there are no significant natural heritage connections either within or extending beyond the subject property, or issues of diversity that would prevent the development proceeding in the area below the brow of the escarpment. Generally, the Board finds that a substantial amount of work has been done to date, sufficient to justify the mapping and policies contained in the draft Official Plan

> amendment, and specifically finds that issues of connectivity and diversity have been addressed.

Thus the Board recognized connectivity as a legitimate planning concern but ruled against the precautionary approach recommended by the Ratepayers.

In Decision Number 0247 (January 24, 2006), Board Member Rossi preferred evidence for an ecosystem approach to planning that considered the "larger surrounding ecosystem". As mentioned earlier, the case involved a proposal to develop seven single residential homes in the City of Etobicoke. Both the City and the Toronto and Region Conservation Authority opposed the development on the grounds that it would cause unacceptable damage to valley corridor and the natural heritage system. They criticized the Applicants approach to studying the subject lands and surrounding area, which focused only on specific and scarce species and did not take into account the larger ecosystem. As described by the Board;

> …the Applicant did not put the ecological function of the subject site in context with the larger surrounding ecosystem. He submitted that a true ecosystem approach to planning comprehensively assesses the functions of the larger ecosystem and insures that any proposed development is considered, located and designed to protect and restore these functions. The proposed development does not do this. The Board found Counsel Wigley's arguments in this regard to be highly persuasive and prefers his characterization of the Applicant's witnesses approach as evidence that the City's and TRCA's witnesses' evidence in these matters must be relied on by the Board instead.

Rossi preferred the ecosystem approach of the City and TRCA and described it as "in keeping with the PPS". The Applicant argued that the City and TRCA did not quantify the potential ecological impacts and thus the Board should prefer the evidence of the Applicant's witnesses as they offered "measurable and quantifiable mitigative efforts for the proposed loss of trees and flora". Rossi, however, continued to prefer the ecosystem approach taken by the City and the TRCA, and countered;

> …where the Applicant's Counsel confidently offers that his witnesses have attempted to measure the impacts on the land, the Board prefers the submissions of Counsel Wigley and the opinions of the

> environmentally-focused witnesses opposed to the application that it is quite simply impossible to provide an accurate measurement of impacts in the environmental world. It is not a cut and dry measurement of the precise number of a species that has been, or will be, lost; or how the proposed development will affect the capacity of species to regenerate, to grow and flourish, or to wither and disappear. Counsel Wigley put it quite succinctly but most effectively in his submissions that in respect of environmental impacts, much of what one loses is what one does not see. The Board also accepts that the cumulative impact of development will substantively alter the ecological performance of the area over time.

Such ecologically-aware reasoning from the OMB has very important implications for planning for landscape connectivity in Ontario. It demonstrates that the OMB is capable of, and willing to, recognize the inherent complexity of ecosystems and the corresponding need to adopt a planning approach that can incorporate complexity, uncertainty, and temporal scale, all of which are key to effectively planning for landscape connectivity.

Rossi continued on to state that even if the Board were to accept the Applicant's argument that the City's and TRCA's witnesses were unable to identify individual impacts from the proposed development;

> …there is sufficient enough reason within the policy regime for the Board to dismiss the appeals and to find that the cumulative environmental impacts on the surrounding natural environment (i.e., the forest and West Humber River Valley system both north and south of Grovetree Road) from the proposed residential development are adverse and significant. The Board also determines that the impacts of the proposed development on the natural heritage system have been identified and are unacceptable. Mitigative measures and compensation for lost habitat/trees are deemed to be insufficient and unacceptable.

Thus Rossi found sufficient evidence in the ecosystem approach and sufficient reasons based on the applicable policies (PPS 1997, Metro Toronto Official Plan, Etobicoke Official Plan and TRCA Valley and Stream Corridor Management Program) to support a ruling in favour of protecting landscape connectivity. Rossi then dismissed the appeals.

Decision Number 2206 (August 3, 2006) provides another example of a case wherein the Board displayed a preference for an ecosystem approach to planning. This case involved application to amend the Official Plan for the Town of Caledon and the Town's Zoning By-law 87-250, to permit the development of a single detached dwelling on a new lot on lands designated as Environmental Policy Areas and zoned Hazard Lands. The Town of Caledon, the Toronto and Region Conservation Authority (TRCA) and local residents all opposed the applications and contended that the lands should not be developed on the basis on their environmental significance. The TRCA's review of the developer's EIS concluded that, overall, "the analysis contained in the EIS was not adequate because it was focused on the development of lands above the top of bank in isolation of an examination of the site's location and ecological contribution to the larger woodland and valley corridor." Board Member Eger agreed with this assessment. Eger stated that the onus was on the applicant to show that the lands were not Environmental Policy Area in character and function for the Board to find it appropriate to alter their current designation and zoning. Eger concluded;

> Having reviewed all the evidence and as contained in these reasons, the Board finds that this onus has not been met and the approval of the applications would not result in good planning. The applications do not have sufficient regard for the Natural Heritage Component of the PPS, 1997, and do not conform to the Region of Peel and Town of Caledon official plan policies for the protection of significant environmental features and their over arching ecosystem approach to planning. The applications also run contrary to the longstanding Valley and Stream Corridor policies of the TRCA.

This statement clearly illustrates the Board Member's support for the ecosystem approach to planning. Eger preferred the evidence presented by the TRCA and the Town of Caledon that considered the ecological impacts that development might have on the surrounding area.

In Decision Number 1411 (May 17, 2007), described on p. 156, the TRCA again advocated for an ecosystem approach. Their position was that an integrated

approach to ecological and environmental issues must be taken when analyzing the site's characteristics, in order to properly assess the value of the site as a whole. They further argued;

> …that development of the site would be a dangerous precedent for the development of other remnant tableland parcels within its jurisdiction. Viewing the site in discrete pieces is contrary to an ecosystem approach. In short, while the landowner may wish to develop it should not be permitted to do so as the result is further urbanization of the valley and green space system.

Support for an ecosystem approach in this case was also found in the Town of Ajax's Official Plan, which included a goal of establishing an "ecosystem based approach" to planning and development. Although Board Member Seaborn did ultimately allow the development appeals in part, development was not allowed in one area wherein Seaborn stated development had the "greatest potential to affect corridor and linkage functions of the valley walls and floodplain of Urfe Creek".

Several cases made use of the Natural Heritage System approach, as recommended by the Natural Heritage Reference Manual. For example, in Decision Number 3289 (November 23, 2006), Board Members Eger and Gates found that the Natural Heritage System proposed by the North Leslie Secondary Plan met the requirements of the Oak Ridges Moraine Plan, the Greenbelt Plan and the PPS. The North Leslie Secondary Plan was based on the principle of "Environment First", meaning that;

> …development will only be approved if it can be demonstrated that the natural heritage system and its functions have been protected and the integrity of the water resource system, both surface and ground water resources, have been protected. In order for the long-term sustainability of the Natural Heritage System, the ecological features and their functions must be protected, restored and enhanced through the development of this plan.

Although the concept of ecological linkages was supported by this case, not all of the proposed linkages for the Natural Heritage System were deemed necessary. For

example, recommendations by Save the Rouge Valley System Inc. for seven additional local scale "connecting corridors", which included corridors between wetland features, additional forest cover as compensation for loss of woodlot area and filling in or rounding off of other features, were rejected in all but one case "as unnecessary for the functioning of the NHS or not reflecting current field conditions". Thus the acceptance of the Natural Heritage System approach by the OMB does not mean that all linkages within a given natural heritage system will be protected.

A Natural Heritage System approach was also used in File Number PL04118 (January 11, 2008). The North Oakville Secondary Plan, developed for the northward urban expansion of the Town of Oakville, was the focus of long and intense negotiations between the municipality and private developers. The planning process included two separate subwatershed studies and two separate subwatershed plans, with the municipal planners and the developers each presenting a different Natural Heritage System for the suburban site. The Town of Oakville and the Regional Municipality of Halton used what they described as a "systems approach" to determining the boundaries of the Natural Heritage System, whereas they claimed that the developers used a "features-based approach". Although the systems approach was not defined in Board Member Campbell's case summary, Campbell strongly favoured the approach and stated, "such an approach constitutes a superior and forward-looking method of protecting this Province's natural heritage". Campbell went on to state that the systems approach was;

> …clearly the best approach given what experts now understand about environmental biology. No longer can society afford to look at the "natural environment" as isolated pockets of green which have been fortunate enough to have survived in an urban landscape. The Board is convinced by the evidence adduced in this hearing, that for the natural environment to have a chance of sustainability in developing urban areas, a systems approach must be taken to delineating boundaries.

Although this statement does not shed further light on what exactly is meant by a systems approach, it does confirm that the OMB, as a result of advances in conservation biology, shows understanding of, and appreciation for, the importance of natural heritage systems.

Connectivity is a vital component of natural heritage systems. One of the issues that remained in dispute with regard to the North Oakville Secondary Plan involved a woodland area which, if developed, might cause "vital connectivity" to be lost. Campbell stated;

> The systems approach to determining the boundary of the NHS is premised, in part, on the need to facilitate species and genetic diversity. Species movement is a necessary precondition to such diversity. The witnesses were of the opinion that excluding certain parts of the Capobianco lands would have a negative impact on species movement.

The landowner did not have an expert witness but instead testified himself as to the lack of wildlife on his property following the construction of Highway 407 (a major barrier to wildlife movement in the area). He objected to being penalized for retaining a woodland on his property and described the North Oakville Secondary Plan as "a clever plan by the Town to acquire private land without compensation". Campbell, however, agreed with the Town's designation for the woodland and stated that the landowner's "wish to take advantage of the development potential of the lands does not outweigh the value of the lands to the preservation of the NHS in North Oakville". This appears to be a clear victory for landscape connectivity but, as closer inspection in Chapter 7's case study will reveal, the concept of landscape connectivity was in fact misapplied in this case and the "non-expert" landowner did make some valid points, especially with regards to the Highway 407 blocking wildlife movement.

The comparative analysis revealed that Board Members displayed a preference for testimony given by professional experts rather than non-professionals. For example, Decision Number 1428 (September 2, 2004) involved an appeal against a zoning by-

law amendment that would allow the construction of a golf course on subject lands which were part of a wetland (Ashton Station Wetland) and which were adjacent to a Provincially Significant Wetland (Manion Corners Long Swamp Wetland). The appellant believed that the "Ashton Station Wetland and the Manion Corners Long Swamp Wetland were either hydrologically connected by a surface water connection and should therefore be complexed together or that the two are just one large continuous wetland." He then "raised the plea for more time to investigate and research the matter". However, the Board noted "no professional opinion evidence was contained in his affidavit material or produced at the hearing of this motion to support his position." The Board preferred the "professional opinion" of an engineer for the City of Ottawa that the claims of the appellant regarding surface water linkage, fish habitat and aquifer problems were not supported by any factual or scientific evidence. This is in keeping with Wilkinson's finding that "seldom was the Ontario Municipal Board persuaded by lay testimony, unsupported by evidence" (Wilkinson, 2002, p. 152).

The designation "ecologist" also came under scrutiny. Decision Number 0886 (June 28, 2002) involved a proposed plan for a residential subdivision. The qualifications of an ecologist who provided evidence in opposition to the proposal were challenged by the applicant "for reasons including her being limited by the lack of post-graduate education and lack of any long-term employment experience". Board Member Granger stated;

> After hearing submissions, the Board recognized a number of short-term contract positions involving the application of her undergraduate education in the field of biology. It was conceded that the title 'ecologist' comes without any professional organization establishing consistent standards of practice, performance or ethics. As with any witness, the Board will carefully weigh the relevance and applicability of the evidence presented.

Although Granger did accept the ecologist's testimony, the above statement reflects the status the Board granted ecologists as non-professionals without "any professional organization establishing consistent standards of practice, performance or ethics."

In Decision Number 1488 (May 18, 2006), the Halton Conservation Authority sought to qualify their Senior Ecologist to give opinion evidence as an ecologist. Board Members Jackson and O'Connor stated, "The Board considers an ecologist as one who has regard for the relationship of all natural life including birds, mammals and reptiles with the environment and each other". In their explanation for qualifying the witness, they stated;

> …those giving opinion evidence do so on the basis of being possessed of special knowledge or skill upon which the expert is called to testify. The particular knowledge may be by way of study or experience. In this case, it is clear to the Board that the witness Barrett should be entitled to testify and give opinion evidence to this Board as a ecologist, by virtue of her education and experience.

Thus the Board recognized the ecologist as having special knowledge or skill and allowed her to testify.

Another debate over the testimony of an ecologist was found in Decision Number 1678 (October 21, 2004), which involved an appeal for a proposed Official Plan amendment for the Town of the Blue Mountains to allow for a large resort development on a 620-hectare property. The applied ecologist who testified on behalf of the opposition described himself as "subscribing to the principles of conservation biology, an emerging science, which involves an 'environment-first' approach to land use planning". Although Board Member Stockton found the evidence of this witness to be "earnest, sincere, principled and professional", he described the witness as not being a qualified land use planner and, ultimately, the Board preferred the evidence of the many expert witnesses of the Allied Parties for their more extensive and "useful" level of study. The disregarding of an ecologist's evidence in this case because he was not

also a land use planner highlights an important problem for planning for landscape connectivity in Ontario. This decision may show a difference of opinion amongst Board Members. Some wish to see ecologists to be also qualified as planners. Others do not make such a requirement.

Planning for landscape connectivity requires specialized expertise from professionals trained in both conservation biology and land use planning. Access to such expertise may be limited by the number of such professionals practicing in Ontario and by the financial resources of many planning authorities. Smaller municipalities, for example, would be unlikely to have such a planner on staff and may not have the financial resources to hire one when needed.

Another issue revealed by the comparative analysis was the recognition of "potential linkages", or linkages which could be rehabilitated or enhanced with proper management. For example, Decision Number 0119 (January 25, 2001) involved a development proposal that would impact a poorly managed woodlot. According to the appellant, this woodlot failed to meet any of the Natural Heritage Reference Manual's criteria for significance. An arborist for the Town of Milton argued in opposition, claiming that with proper management the ecological qualities of the woodlot could be improved. He highlighted the "potential for a wildlife corridor linkage" between the woodlot and a tributary of Sixteen Mile Creek. However, Board Member Watty noted that improving the ecological qualities of the woodlot would require a management plan implemented by a willing owner and could not be achieved under present conditions. Thus the Board dismissed the idea of a potential linkage because its implementation was not possible given the circumstances, but not because the idea itself was unacceptable.

Decision Number 1696 (December 12, 2002) made reference to the potential for enhancing connectivity. This case involved a development proposal for 1.9 hectares

of vacant land on the Thames River in the City of London. The potential for the development to impact natural heritage features and the Thames River corridor was a significant issue at the hearing for both the City and area residents. To ease these concerns, the developer proposed designating a 30-metre corridor as Open Space land use and transferring ownership of this privately-owned land to the City. A City staff report agreed that "opportunities exist for enhancement of the existing situation through the conveyance of a corridor of the site to the City". The City report continued;

> The proposed development, if coupled with municipal acquisition of the non-developable area from the river's edge to beyond the top of the bank, meets many of these [Plan] objectives in that:
> - A continuous liner open space network along this section of the Thames River would be maintained.
> -The opportunity for linkage to Gibbons Park and other major open space nodes along the corridor would be maintained.
> There is nothing to suggest that the contribution that the corridor makes to urban form and community design would be diminished by the recommended form of development. On the other hand, this contribution may be enhanced if the non-developable lands are acquired for public use (Staff Report, June 24, 2002, at p.10).

After considering the environmental evidence, Board Member Seaborn concluded that, "while there is no question that the Thames River is an important natural heritage feature, it does not follow that the proposed development will threaten the river itself or its corridor function". Seaborn allowed the development appeals in part and stated that the decision also relied on "Rival's intention to convey surplus lands to the City, which will ensure there is at least a 30 meter corridor along the bank of the Thames River that will remain in the Open Space designation and continue to be accessible to the public". Thus the opportunity to enhance connectivity was a key factor in the Board's decision to allow the development.

In Decision Number 0455 (April 9, 2003), Board Members Daly and Katary ruled that a development proposal for a golf course would not degrade

corridors for the movement of birds, wildlife and flora along the Grand River. They stated that;

> …the intent to naturalize some areas now under cultivation will reinforce this goal. The Board is fully satisfied that the Grand River Corridor will not be degraded by this proposal, but will be enhanced through an aggressive environmental management process regulated by the Region and implemented by Kitchener.

In this case, the Board believed that "aggressive management" would in fact improve landscape connectivity.

Decision Number 2536 (September 17, 2007) also referred to the potential of improving a linkage. Board Member Granger concluded that;

> The Board is satisfied that the boundary of the BBCESL is most appropriate with the inclusion of the subject lands. To exclude the lands and leave open the prospect of future development potential could result in a significant narrowing of the landscape connection between the natural lands identified to the west with the natural lands identified to the east and less prospect of the potential to improve and expand the natural swale area linkage along the north boundary of the subject lands.

In this case, the potential for improving and expanding a linkage was considered valuable enough to be used to explain and support the Board's final ruling.

In all four cases, the idea of improving, enhancing or expanding "potential" linkages through management practices was recognized as a valid planning concern by the presiding Board Member. Both the PPS 1997 and the PPS 2005 make reference to improving connectivity. Policy 2.3.3 of the PPS 1997 states that "the diversity of natural features in an area and the natural connections between them should be maintained and *improved where possible*". Policy 2.1.2 of the PPS 2005 states;

> The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, *restored or, where possible, improved,* recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.

The above cases suggest that the OMB does recognize the potential for improving landscape connectivity as a consideration in its rulings in the last 7 years of activity.

6.4 Conclusion

This research reveals that in the last decade, the OMB is, in general, applying provincial policies in favour of landscape connectivity on private land in Ontario. In a strong majority (74%) of cases between January 2001 and January 2008 in which landscape connectivity was a deciding factor, the OMB ruled in favour of maintaining, improving or restoring landscape connectivity. Policy 2.3.3 of the PPS 1997 was used most frequently to support landscape connectivity and the comparative analysis suggests that the OMB was indeed "having regard to" Policy 2.3.3 in their case reviews and decision-making. The Board ruled against protecting landscape connectivity in both cases involving the *Niagara Escarpment Development Act* and Plan, in favour of protecting landscape connectivity in both of the cases involving the *Oak Ridges Moraine Conservation Act* and Plan, in favour of protecting landscape connectivity in four of the six cases involving the PPS 2005, and in favour of protecting landscape connectivity in all three of the cases involving the *Greenbelt Act* and Plan. While the numbers of these other policies are too low to draw firm conclusions, it does appear that the OMB is, in most cases, applying the policies in favour of landscape connectivity.

The comparative analysis revealed that the OMB was receptive to an ecosystem approach to land use planning and regarded it as appropriate, necessary and in keeping with provincial policy. It is encouraging to note that the ecosystem planning approach was recognized and, in cases, preferred by the OMB. Chapter 2 identified ecosystem planning and management as one of three planning approaches best suited

for landscape connectivity in Ontario, due to its usefulness in addressing concepts of uncertainty, scale and dynamic non-equilibrium.

Planning for landscape connectivity was conducted as part of the ecosystem approach, the precautionary approach and the Natural Heritage System approach. In each of these approaches, and in OMB cases that did not specify a planning approach, landscape connectivity was recognized as an essential component of healthy natural heritage systems. There was not a single case in which the OMB argued against the value of landscape connectivity, although economic interests were sometimes considered more valuable to the public interest. Even the concept of potential linkages was treated as a legitimate planning concern, which suggests that the provincial policy of maintaining and improving connectivity, where possible, is indeed being given due consideration by the OMB.

The large number of terms used for landscape connectivity in the OMB cases remains problematic. The literature review for this dissertation revealed that the term `corridor' alone has a widespread and varied usage within many different disciplines, which has led to much confusion over what corridors are and what the goals of planning for corridors should be (see Dobson *et al*., 1999; Hess and Fischer, 2001). Witnesses and Board Members in the 36 cases analyzed used 57 different terms for corridors, linkages and connectivity. This is confusing, especially given that very few case decisions defined their terms.

Supporting documents, which provide detailed information that might help to clear confusion over terms, were used infrequently. The Natural Heritage Reference Manual was used to support connectivity in only six cases. The Significant Wildlife Habitat Technical Guide, which was shown in Chapter 5 to contain the most landscape connectivity statements and some of the most detailed landscape connectivity information of Ontario's planning documents, was not used to support landscape

connectivity in any of the cases before the OMB. The supporting documents are meant to assist planning authorities and other participants in the municipal planning system by providing detailed information. However, their use is discretionary and, as this analysis suggests, they are either not being used or are not being referenced before the OMB.

The comparative analysis has revealed, overall, that the OMB is indeed having regard to landscape connectivity as a legitimate planning concern. In most of the cases in which landscape connectivity was identified as a deciding factor, the presiding Board Member ruled in favour of protecting landscape connectivity. Lest this paint too rosy a picture, however, it is important to note that this chapter has used as its basis of analysis the written decisions of the OMB and has focused on how the OMB interpreted and applied relevant landscape connectivity policies. "Success" may be reflected in the planning documents, but not necessarily on the ground (Wilkinson, 2008). Chapter 7 will examine several case studies that were selected to represent the spectrum of land use planning in Ontario with regard to landscape connectivity.

7 Landscape Connectivity Case Studies

7.1 Introduction

This chapter 7 presents four landscape connectivity case studies from Ontario. The case studies were selected to represent the spectrum of land use planning in Ontario with regard to landscape connectivity. As described in Chapter 3, the case studies were selected based on three criteria:

1) **Scale**: The cases were selected to represent the regional, landscape and local scales of landscape connectivity planning.

2) **Planning Authorities**: The cases were selected to represent a variety of land use planning in Ontario, namely provincial planning, municipal planning, private planning, and conservation authorities' planning.

3) **Guiding Documents**: The cases were selected to represent the different legislation, policies and guidelines that apply to landscape connectivity planning in Ontario.

The case studies are the North Oakville Secondary Planning Process, the Oak Ridges Moraine Planning Process, the Raisin Region Conservation Authority Natural Heritage Strategy, and the Lands for Life Planning Process.

The analytical focus is on the planning process, not the result, of each landscape connectivity project. This is due both to the planning focus of this research and to the difficulty in assessing the success of landscape connectivity projects at the implementation stage. Anderson and Jenkins (2006) examined dozens of the hundreds of corridor projects around the world and found that almost all of the projects were in the planning stage, very few were under implementation, and none had been underway for long enough to effectively evaluate its results. Morrison and Boyce (2008) also

noted that the conservation literature contains few examples of protected corridors, and they found even fewer discussions of issues that conservation practitioners encounter when implementing a corridor. The case study results found in Chapter 7 will show that in Ontario there are examples of linkages projects that have been implemented and the results will highlight important issues for planning and implementation. The temporal scale at which landscape connectivity projects, such as habitat corridors in large landscapes, should be scientifically evaluated is decades or centuries (Ahern, 1999). The case studies selected for this research have not yet reached the point at which such an evaluation of efficacy can be made.

7.2 Comparison of the Four Case Studies

The case studies were examined using the analytical framework presented in Chapter 3 (see Figure 3.1). For each case study, the following questions were asked.

1. Is the planning process interdisciplinary and public?

The study of landscape connectivity is interdisciplinary, deals with spatial, biological and temporal analysis at multiple scales and factors in human influences; therefore it requires an integrated, interdisciplinary planning approach (Ahern, 1999; Bennett, 2003; Crooks and Sanjayan, 2006; Hilty et al., 2006; Kleyer at al., 1996; Linehan and Gross, 1998; Opdam et al., 2002). The planning approach should also include public participation, as the implementation of the landscape plan will impact citizens and stakeholders (Ahern, 1999). As discussed in Chapter 2, stakeholder participation is key to the success of landscape connectivity projects, especially as connectivity projects often involve both public and privately-owned lands.

2. Are landscape connectivity goals and assessments defined?

Effective strategic planning requires integration of interdisciplinary knowledge to define strategic goals that are consistent with political will, economic factors, and the condition of the existing landscape (Ahern, 1999). Landscape plans, however, often focus on abiotic and biotic goals and neglect cultural goals. It is important that abiotic, biotic and cultural goals and assessments are defined. In Ahern's framework, abiotic goals include water resources, soil and air quality; biotic goals include biodiversity in general; and cultural goals include transportation, land use, recreation, historic preservation and economic goals. This analysis will examine the goals of the case studies as they relate to landscape connectivity.

3. **What approach to linkage identification and design is employed**?

Noss and Daly (2006) examined conservation planning literature and identified three basic approaches to the design of broad-scale linkages: 1) intuitive or "seat-of-the-pants" approaches; 2) empirical approaches; and, 3) modeling approaches, along with many combinations of the above. The approach to linkage design in the case studies will first be assessed using these three basic approaches, and then, if applicable, the spatial concept used for linkage design will be identified. Possible spatial concepts for landscape connectivity include the Patch-Corridor-Matrix model (Forman, 1995), stepping stones, greenways, and natural heritage systems.

4. What types of planning strategies are employed?

Ahern (1995) identified four fundamental strategies that can be employed in landscape planning: protective, defensive, offensive, and opportunistic. The protective planning strategy articulates the spatial pattern that is most desirable and protects it from change. The defensive strategy seeks to control and arrest negative processes of

landscape change, such as fragmentation. The offensive strategy is inherently proactive and promotes a possible future landscape that can only be realized by restoration. The opportunistic strategy takes advantage of unique landscape elements, like old railroad lines, that can be used in conjunction with other strategies.

5. Are alternative scenarios for landscape connectivity evaluated?

Scenarios are used in landscape planning to link goals and assumptions with potential future spatial changes (Ahern, 1999). They should include a description of the current condition, a potential future landscape and a means of implementation.

6. Is there a landscape connectivity plan?

This question simply asks whether a landscape connectivity plan exists. This does not have to be a stand-alone document but can be part of a larger plan, provided that policies, goals and actions are presented for landscape connectivity.

7. Is there a policy of adaptive planning and management?

As discussed in Chapter 2, adaptive planning and management is a `learning by doing' approach that follows a scientific, rational process but admits a level of ignorance about the workings of ecosystems and the outcomes of management, and monitors the system to allow for adjustments in management (Noss et al., 1997; Peck, 1998). Adaptive planning and management is critical to a concept like landscape connectivity, which is inherently uncertain. Lack of funding and a social context that constrains land-use planning options further necessitate the use of an adaptive approach for connectivity projects (Hilty et al, 2006).

In order to summarize each of the four case studies, Table 7.1 presents a comparison of the four case studies.

Table 7.1. Comparison of Four Landscape Connectivity Case Studies

PLANNING THEME	OLL	ORM	RRCA NHS	NORTH OAKVILLE	
				Town	Landowners
Is Planning Process Interdisciplinary? Public?	Somewhat Somewhat	Yes Yes	Yes Yes	Yes Yes	Yes No
Landscape Connectivity Goals and Assessments -Abiotic -Biotic -Cultural	 No No No	 Yes Yes Yes	 No Yes No	 No Yes Yes	 No Yes Yes
Approach to Linkage Design	N/A	Intuitive; Natural Heritage System approach	N/A	Intuitive; Natural Heritage System approach	Intuitive; Natural Heritage System approach
Planning Strategies	Opportunistic	Defensive	Defensive/ Offensive	Offensive	Defensive
Alternative Landscape Connectivity Scenarios	N/A	Yes	N/A	Yes	
Landscape Connectivity Plan	No	Yes	No	Yes	Yes
Adaptive Management	No	Yes	Yes	Somewhat	No

The data presented in the following sections reflects what was included in the planning process, which may not reflect all the information that was actually available to planners during the timeframe of each case study. Also, the information presented is document-based.

7.3 Case Study: North Oakville East Secondary Planning Process

The North Oakville East Secondary Plan is part of the largest planning process underway in Ontario (Town of Oakville, 2007). The North Oakville East Secondary Plan was developed for the northward urban expansion of the Town of Oakville. It was the focus of long and intense negotiations between the municipality and private

landowners and developers. The planning process included two separate subwatershed studies and two separate subwatershed plans, with the municipal planners and the private planners each presenting a different Natural Heritage System for the suburban site. The case provides an interesting and recent example of the challenges of planning for landscape connectivity at the local level.

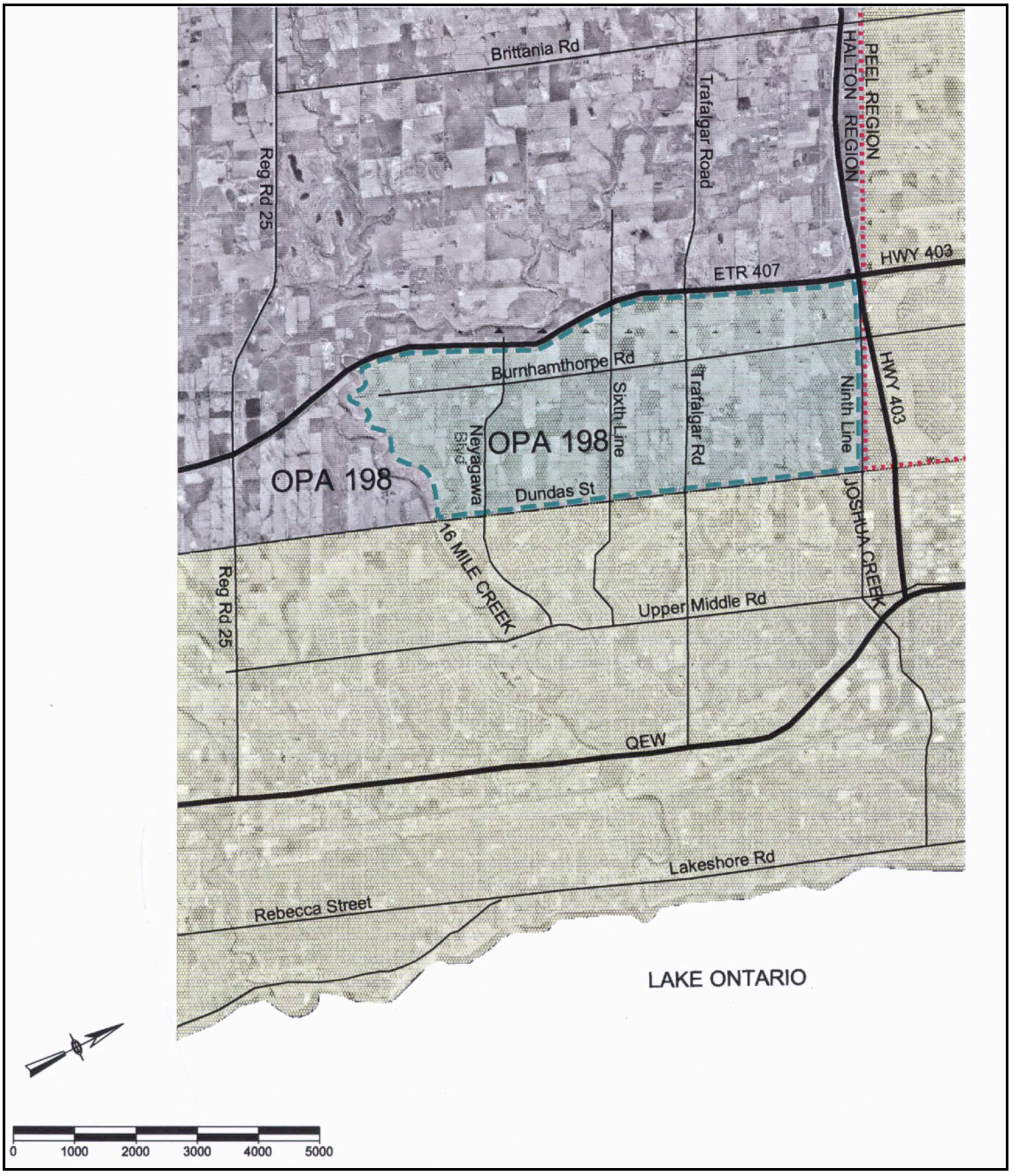
7.3.1 *Study Setting:*

The North Oakville Lands consist of 3,000 hectares of land in the Town of Oakville, located north of Dundas Street, south of Highway 407, west of Ninth Line, and east of Tremaine Rd. The focus of this case study is the North Oakville East Lands, which include the above lands east of Sixteen Mile Creek (see Figure 7.1). The North Oakville East Lands consist of a predominantly agricultural ecosystem, which is composed mainly of open fields that have been in this state for almost 200 years. There are also scattered remnants of forest, wetlands and modified stream valleys (NOMI, 2004). The remnant vegetation in the North Oakville East Lands displays a typical pattern for Southern Ontario and has significant implications for the identification, delineation and restoration potential of a local Natural Heritage System (Town of Oakville, 2006). Urban land uses are interspersed throughout the area, including retail, institutional, public, and private open space uses (NOMI, 2004).

Part of the North Oakville East Lands is located on the Trafalgar Moraine, which forms a defined ridge that separates the East Sixteen Mile Creek from other watersheds in the area (Town of Oakville 2004). Although the opposition to the urban expansion attempted to equate development on this site with development on the Oak Ridges Moraine, the two moraines are not of comparable environmental significance. The Trafalgar Moraine is composed of silty to clayey-silt Halton Till sediment and so the recharge to the groundwater system is quite low. Several scientific studies

undertaken on the North Oakville portion of the Trafalgar Moraine concluded that it was not geologically unique or scientifically significant and its geology does not pose a constraint on urban land uses and development (Stantec et al., 2004).

Figure 7.1 North Oakville East Lands



(North Oakville Management Inc., 2004)

7.3.2 Planning History

On May 29, 2002, Council of the Town of Oakville approved Official Plan Amendment 198 (OPA 198) to urbanize 3,000 hectares of countryside north of Dundas Street. This area, bounded by Highway 407 in the north, Dundas St in the south, Nine Line in the east and Tremaine Rd. in the west, became known as the North Oakville Lands. The North Oakville Lands were slated to eventually house 55,000 residents and provide industrial space for 35,000 workers. The Town's plan for the North Oakville Lands proved to be highly controversial. On the same day that OPA 198 was approved, MPP Mike Colle introduced a private member's bill, *The Trafalgar Moraine Protection Act*, to protect and preserve the Trafalgar Moraine. Colle, who previously introduced a successful 1999 bill that called for the protection of the Oak Ridges Moraine, hoped to temporarily freeze the proposed development on the North Oakville Lands. Also protesting OPA 198 were local environmental groups and a coalition of landowners, who made appeals to the OMB in June 2002.

On August 6, 2003, the OMB was notified that a settlement had been reached between the Town and Clear the Air Coalition, Oakville Green Conservation Association Inc. and the Residents Association North of Dundas (Sorensen Gravely Lowes, 2004). OPA 198 was modified to reflect the settlement of those parties and approved by the OMB on September 12, 2003. OPA 198 established a general framework for the preparation of more detailed secondary plans and identified the need to prepare separate secondary plans for the areas west and east of Sixteen Mile Creek (Sorensen Gravely Lowes, 2004). OPA 198 also identified a number of requisite studies to be undertaken prior to approval of a secondary plan, including an analysis of the linkage component of the natural heritage/open space system.

The Town had begun working towards secondary plans with the initiation of the *North Oakville Creeks Subwatershed Study* in January 2002. The purpose of the

Study was to "develop a subwatershed plan that allows sustainable development while ensuring maximum benefits to the natural and human environments on a watershed basis" (Town of Oakville, 2006). The Town had two major goals for their secondary plans: 1) the plans had to ensure the preservation of a sustainable natural heritage system that could maintain a diversity of species and landscapes in an urban context; and, 2) the plans had to provide for a walkable, compact, and diverse community, developed in a New Urbanist form (Town of Oakville, 2006).

At the same time, a group of landowners that came to be known as the North Oakville Management Inc. (NOMI) worked on their own *North Oakville East Subwatershed Study*, initiated in August 2000. They assembled an interdisciplinary team of consultants to address the range of environmental issues in the study area subwatershed, including linkages for the natural heritage system. Although NOMI's subwatershed study was conducted in parallel with the Town's subwatershed study, NOMI participated throughout the Town's subwatershed process by sharing information, providing input on the Town's technical reports, attending public information sessions and participating in the Town's Technical Advisory Committee for their study (Stantec et al., 2004).

In May 2003, the Town initiated the Inter Agency Review (IAR) to make recommendations regarding a sustainable natural heritage system within an urban context in North Oakville. The IAR allowed for input during the development of the Secondary Plan from the Ministry of Municipal Affairs and Housing (MMAH), the Region of Halton, the Ministry of Natural Resources (MNR) and Conservation Halton. In September 2003, the Town released the *North Oakville Planning Authorities IAR Phase 1 Report*, which presented guiding principles and a map of a conceptual natural heritage system for the Town to consider when developing the North Oakville Secondary Plans. The report recommended the creation of a natural heritage/open

space system comprised of core natural areas connected by a system of linkages. The number and extent of the proposed core areas far exceeded the recommendations of the *North Oakville Natural Heritage Inventory and Analysis* (2000)*,* which was previously undertaken by consultants retained by the Town to identify a natural heritage/open space system for North Oakville (Sorensen Gravely Lowes, 2004). Neither the landowners (NOMI) nor their consultants were part of the process that led to the completion of the IAR report. While NOMI agreed in principle with the protection and management of "environmental core areas versus isolated, scattered, small environmental pockets", it did not concur with the "extent and location of the proposed core areas and linkages or allowable uses in the core areas". NOMI found that;

> The IAR Report ***lacks supporting scientific justification***; presents inaccuracies in mapping; and is based to some degree on technical information/analysis with which the Landowners' Subwatershed Study team do not concur. ***Until scientific rationale for*** the core area delineations and ***conceptual linkages is presented and reviewed, the IAR cores and linkages are not supported as appropriate environmental lands for protection*** in the Subwatershed Study or the Secondary Plan (Stantec et al., 2004).

In addition to concern over the lack of scientific support for the IAR Report's linkage locations and width, NOMI expressed "serious concern over the lack of opportunity for Landowners' input to the IAR Report" (Stantec et al., 2004).

In September 2003, the Town invited a team of new urbanists to conduct a ten-day charrette in which four different new urbanist designs were sketched for North Oakville. NOMI presented its proposed development concept for North Oakville East and the NOMI concept formed the basis for one of the four plans carried through the charette and its numerous public sessions (Sorensen Gravely Lowes, 2004). These plans served as input for the Town's draft North Oakville Secondary Plans (Town of Oakville, 2006).

In February 2004, the first drafts of the Town's North Oakville Secondary

Plans were released for public review. The Town's Subwatershed Study, the plans created during the design charrette, and other studies undertaken on behalf of the Town, together with "substantial public consultation", all served as input to the development of the Town's draft Secondary Plans. Following further public consultation, the drafts were brought forward with recommendations for further study and review (Town of Oakville, 2006).

In March 2004, NOMI filed an application for a proposed official plan amendment to establish a *North Oakville East Secondary Plan*. In November 2004, NOMI commenced the appeal. In December 2004, a public meeting was held before Town Council. According to the Town of Oakville, "certain North Oakville Landowners pre-empted the Town's lengthy public consultation process" by appealing their own proposed Secondary Plan of North Oakville East to the OMB (Town of Oakville 2006, p.1). NOMI, however, was of the opinion that the Town had intentionally left them out of the loop by not sharing information.

The Town then completed a draft *North Oakville East Secondary Plan* to advance at the OMB as the Town's response to the Secondary Plan proposed by NOMI. Pre-hearings for the OMB took place in 2005. The Town and NOMI began negotiations in May of 2006 and, by August 14, 2007 a comprehensive settlement was reached by the Town and most of the landowners. It was agreed that the Town's Secondary Plan would be put forward at the OMB hearing. The landowners also agreed to donate to the Town, free of charge, all of their lands in the Town's proposed Natural Heritage System. These concessions by NOMI would serve to significantly decrease both the time and expense of the subsequent OMB hearing. Further settlements were reached during the hearing and the remaining issues were decided upon by the presiding Board Member. The North Oakville East Secondary Plan was approved by the OMB in February 2008.

7.3.3 Comparison to Analytical Framework:

The results for the planning process for the Town's Secondary Plan and NOMI's Secondary Plan are presented separately. Documents reviewed include the Town's North Oakville Creeks Subwatersheds Studies Draft Analysis Report (2003), the Town's North Oakville Creeks Subwatersheds Studies (2004), the Town's North Oakville East Secondary Plan (2008), NOMI's North Oakville East Secondary Plan (2004), NOMI's North Oakville East Subwatersheds Study (2004), NOMI's Input to the North Oakville East Secondary Plan (2004), the Landowners North Oakville East Secondary Plan Planning Assessment Report (2004), and LGL's North Oakville Natural Heritage Inventory and Analysis (2000).

Is the planning process interdisciplinary and public?

Town of Oakville: The Town's study team included an interdisciplinary roster of consultants, with assistance from the Town of Oakville, Region of Halton, Halton Region Conservation Authority, and the MNR (Town of Oakville, 2006). The IAR also made recommendations for a natural heritage system in North Oakville.

The North Oakville Creeks Subwatershed Study included public participation for the purpose of identifying the key issues, developing a vision and objectives, discussing analysis findings for characterization and development of a management and greenspace strategy (Town of Oakville, 2006). The main process for input was from key stakeholders on the Technical Advisory Committee. Other methods for public participation included public meetings, a Steering Advisory Committee, Council meetings and a design charette.

North Oakville Management Inc. (NOMI): NOMI's interdisciplinary study team of consultants consisted of experts in surface water, hydrology, hydraulics, natural

heritage, natural heritage linkages, geology, hydrogeology, quaternary geology and fluvial geomorphology (Stantec, 2004). The planning process was not public, although public comments were used to modify the NOMI development concept following the design charette (Sorenson Gravely Lowes, 2004). NOMI also participated in the Town's Technical Advisory Committee.

Are landscape connectivity goals and assessments defined?

Town of Oakville: The Town's Subwatershed Study provides the following assessment of ecological linkages on the North Oakville East Lands;

> The North Oakville lands contain a variety of habitat types including agricultural fields, pasture, hedgerow, pioneer vegetation, mature woodlands, wetlands, and valleys, and have been described as a remnant agricultural landscape (Gore & Storrie and Ecoplans, 1996; LGL, 1999). The function of these lands has been influenced by ***urbanization to the immediate south***, and by the local road network throughout the area. ***These roads have increased the amount of habitat fragmentation and have created barriers to ground travelling wildlife within the area and to areas adjacent to the subject lands. Connectivity*** between some northern and southern patches of habitat ***within the site appears to be maintained by the vegetated creek corridors,*** mainly Sixteen Mile Creek and Joshua's Creek (Town of Oakville, 2004, 4E-75).

Thus the Subwatershed Study reports that the function of the study area lands is already impaired by urbanization to the south and local roads which have increased habitat fragmentation and block wildlife movement both within and to areas adjacent to the study areas. Existing connectivity is maintained by north-south creek corridors, mainly Sixteen Mile Creek and Joshua's Creek.

The Subwatershed Study then identifies, based on field mapping, five types of existing "habitat connections":

> Agricultural fields and open field habitats;
> Hedgerows – Generally single rows of trees, sometimes double rows, often shrub-dominated or mixed;
> Riparian habitats – associated with watercourses that are primarily meadow and/or marsh habitats;

> Stepping stones created by proximity of habitat types with little connecting habitat; and,
> Connectivity created by contiguous woodland habitats (Town of Oakville, 2004, p. 4E-76).

Thus the Town identifies a variety of existing linkages in the study area: open fields, hedgerows, riparian corridors, stepping stones and woodlands.

Landscape connectivity is identified as an important component of the Town's North Oakville East Secondary Plan (NOESP). The Town's NOESP begins with a vision statement. Policy 7.2.2 Vision states;

> North Oakville's development as an urban community shall reflect Oakville's distinct historical roots and small-town heritage and Trafalgar Township's village rural heritage, with nodal development, prestige industry, and ***green linkages*** continuing to define Oakville's unique landscape….
>
> The character and pattern of the community will be significantly influenced by a ***planned natural heritage and open space system***. This natural heritage and open space system is designed to ***protect the natural environment, provide a balance between active and passive recreation needs and contribute to the quality of life*** in North Oakville and the Town as a whole. A key component of the system will be the provision of an opportunity for residents and employees to use an ***extensive open space trail system***.

Thus the vision statement for the Town's NOESP identifies three goals for the natural heritage system: protecting the natural environment, providing recreational opportunities for the human community, and contributing to overall quality of life in the area. These goals are supported by Policy 7.2.3 General Development Objectives, which are intended to guide future development of the planning area. The first three objectives feature landscape connectivity;

> i. To establish as a ***first priority of the Town, a natural heritage and open space system,*** within the context of an urban setting, the majority of which is in public ownership.
> ii. To create a ***sustainable natural heritage and open space system*** which provides a balance between active and passive recreational needs and ***links to the existing open space system*** within the Town.
> iii. To ***identify, protect and preserve natural heritage features*** within the natural heritage component of the natural heritage and

> open space system and ensure that their use respects their functional role as natural areas within the ecosystem.

These objectives confirm that the first priority of the Town is establishment of a natural heritage and open space system, and that this system will provide recreational needs, and that natural heritage features and functions within the system are to be protected.

Abiotic goals for landscape connectivity are not identified. Both biotic and cultural goals for landscape connectivity are identified and are presented below.

Biotic goals for landscape connectivity are found in Policy 7.3.5 Natural Heritage and Open Space System, which identifies Linkage and Optional Linkage Preserve Areas as areas designed to link Core Preserve Areas together to "maintain and enhance their environmental sustainability". These linkages "follow natural features whenever possible and are intended to be of sufficient size and character, including buffers, to ensure the functionality and sustainability of the Natural Heritage component of the System". However, there is no mention of the specific purpose of each linkage, the species it is intended for, or any justification for proposed widths. "Environmental sustainability" is too vague a goal for linkages. As discussed in Chapter 2, linkages are species-specific, multi-scale and multi-functional, and they can function as conduit, habitat, filter, barrier, source and sink, often simultaneously, depending on the perspective of the target species. Planning for connectivity should therefore be based at least partially on known behaviour of target species (Bowne et al, 2006).

A cultural goal for landscape connectivity in the NOESP is the provision of recreational opportunities for the human community via a trail system. This goal is supported by the General Development Objectives, intended to guide the future urban development of the Planning Area, which lists its second objective as;

> To create a sustainable natural heritage and open space system which provides balance between active and passive recreational needs and

links to the existing open space system within the Town.

The trail system is thus intended to be part of the natural heritage system.

North Oakville Management Inc. (NOMI): NOMI hired a consultant, as part of their study team, to provide expertise on natural heritage linkages. Appendix K of NOMI's Subwatersheds Study is a 93-page report on Linkages and Buffers on the North Oakville East Lands, which provides an assessment of regional and local connectivity of the study;

> The North Oakville East ecosystem is now ***relatively isolated from other ecosystems by barriers*** that include ***urbanization to the south and the east*** as well as ***major transportation corridors to the south*** (Dundas Street, also known as Highway 5), ***east*** (403 Expressway Link) and ***north*** (407 Expressway).
>
> There is ***some internal, local connectivity*** from the western portion of the North Oakville East lands to the 16 Mile Creek valley system to the west. ***Functional regional connectivity occurs only in and through the 16 Mile Creek system***. There is ***no functional regional connectivity elsewhere on the North Oakville East lands.*** Some opportunities exist to ***maintain local, on-site connectivity amongst natural ecosystem elements*** (NOMI, 2004, Appendix K, pp. 4-5).

Thus NOMI's assessment is that the study area is too isolated by roads and urbanization to provide regional connectivity, except for one north-south valley corridor (16 Mile Creek). Opportunities exist to maintain local, on-site connectivity.

The vision statement for NOMI's secondary plan features landscape connectivity as an important component of the long-term vision for the proposed communities in the study area. Policy 4 states;

> …The character and pattern of each Community will be highly influenced by a planned natural heritage / open space system which protects the natural flora of the area while providing extensive habitat for native animals and providing areas for passive and active recreational use. This natural heritage / open space system affords residents the opportunity to use an extensive open space trail system, which travels through mature woodlot blocks, around wetlands, through parks, along stream corridors and along safe and enjoyable streetscapes.

The above vision statement identifies three goals for the planned natural heritage/open space system: protecting natural flora, providing extensive habitat for native animals, and providing areas for passive and active recreational use via an open space trail system. These goals are supported by the Environment and Open Space policies under the General Development Objectives. Among these objectives are:

> 1. To establish as a first priority, a natural heritage/open space system within the context of an urban setting that ***protects, preserves and, where appropriate, enhances*** significant natural heritage features, functions and ***linkages***.
> 2. To create a ***sustainable natural heritage / open space system*** which provides for both active and passive recreational needs as well as pedestrian connections within the community and to the existing openspace system south of Dundas Street.
> 3. To ***balance the natural ecological needs*** with housing and employment needs of the Town, the ability to create compact transit supportive communities and the social, recreational and economic needs of Oakville residents.
> 4. To evaluate through the Subwatershed Study the significance of all natural heritage features and functions within the North Oakville East Secondary Plan area and to establish a policy framework for more detailed levels of evaluation at succeeding stages of the planning process.
> 5. To promote wooded urban squares as special focal points within the community.
> 6. To ***protect significant valleys and stream corridors*** while recognizing that many other stream corridors within the Secondary Plan Area are intermittent and have been modified by agricultural activities and may be further modified, realigned or consolidated.

These objectives confirm that the first priority of the NOESP is the establishment of a natural heritage and open space system that protects, preserves and, where appropriate, enhances linkages. This system is intended to balance ecological needs with the needs of the human community, including passive and active recreational use. Landscape connectivity is thus identified as an important component of NOMI's NOESP. Like the Town's NOESP, biotic and cultural goals are presented but abiotic goals for landscape connectivity are not presented.

The Greenland Policies of the Land Use Plan for the NOESP include a

section on linkages. Policy 1.1.1.2 e) vii Linkages states;

> Linkages identify existing Natural Areas and potential Restoration Areas that currently provide a natural linkage function for wildlife species typical of the Secondary Plan Area. The primary function of linkages is to maintain connectivity for wildlife populations and/or habitats that are naturally continuous. Linkages should not be established between areas that previously did not exhibit functional connectivity.

Thus the primary biotic goal of linkages is to maintain connectivity for wildlife populations and/or habitats that are naturally continuous.

A cultural goal for landscape connectivity in NOMI's NOESP is the provision of recreational opportunities for the human community via a trail system. Policy 1.11.4 The Transportation and Transit Network includes a section on trails. Policy 1.11.4 d) Cycling & Pedestrian Trails states;

> The Urban Design and Open Space Guidelines establish a potential pedestrian and cycling trail system. This trail system provides connections within Greenland Area designations, along the boulevards of arterial roads, and along portions of collector roads that are critical to the continuity and connectivity of the trail system. Cycling trails are primarily located within open space lands and street boulevards and not located within roadways of high volume arterial roads. Cycling along local roads within neighbourhoods will be facilitated by an interconnected street and open space system.

The proposed trail system will connect with Greenland and open space lands. Further in the Subwatersheds Study, the potential for the trail system is expanded upon;

> Along with considering the need for wildlife connectivity, it is important at this stage in the design process to ***consider the need for human connectivity elements*** on the North Oakville East lands east of 16 Mile Creek. The careful planning that has gone into designing ecological linkages, buffers and natural areas for the site can be used as the groundwork for designing a detailed trails plan for the North Oakville East lands. A trail system can provide opportunities for ***recreation*** (e.g. walking, bicycling, roller blading), ***education*** (e.g. nature walks for school children) and ***natural history*** (e.g. bird-watching, plant identification, wildlife-viewing) (NOMI, 2004, Appendix K, p. 80).

Thus two additional cultural goals for landscape connectivity are identified by NOMI: education and natural history.

What approach to linkage identification and design is employed?

Both the Town and NOMI employ an intuitive, natural heritage system approach based on a system of core areas, linkages and buffers. In general, the approaches are similar but there are significant differences. The approaches will first be presented separately, and then they will be compared.

Town of Oakville: Existing linkages were identified based on field mapping, aerial surveys, and wildlife observations. The Town's Policy 7.4.7 Natural Heritage Component of the Natural Heritage and Open Space System states that the length, width and general location of the linkages were defined based on factors established through the North Oakville Creeks Subwatershed Study, including:

- Composition of potential linkage feature;
- Character of the surrounding habitats;
- Presence and size of discontinuities; and,
- Required buffers.

Again, it is important to note that these factors do not include a specific purpose of each linkage, target species or species requirements, all of which are key factors affecting the likelihood of linkage success (Bennett, 2003). Whereas the Town's NOESP presents the process for determining width of stream corridors in detail, (see Appendix 7.4 Stream Components), there is no similar rationale given for the widths assigned to the linkages.

The Town's Subwatersheds Studies refers to several important linkage design considerations but does not put them into practice. For example, it states, "Ecological linkages must be designed with an understanding of the species that will use the connection" (Town of Oakville, 2004, p.6-18). However, there is no corresponding mention of which species will use the Town's linkages. It states, "A diversity of linkage types and a measure of redundancy in the linkage network should be

considered to provide a range of movement opportunities" (Town of Oakville, 2004, p.6-18). It then states that all linkages should be 100 meters wide. Despite recognizing the importance of having a variety of linkage types and despite previously acknowledging the existence of several types of linkages on site, including stepping stones, the Town plans for only one type and one width of linkage. The 100 meter width may be excessive and is not ecologically necessary given the existing low-level of linkage function on site. Many of the proposed linkages contain roads, driveways, buildings and fences, all of which are serious barriers to connectivity that the Town does not address. Some of the proposed linkages lead to nowhere (there is no end habitat) and two of the proposed linkages do not function in support of any linkage goal. In addition, the Town does not have ecological restoration plans for their proposed linkages, yet their intent is for the linkages to become forested.

North Oakville Management Inc. (NOMI): The linkages were determined using aerial photographs, maps, and the habitat requirements of target species selected for the study area. Subsequent field observations "suggest that these linkage sites provide the highest probability of movement for species that require forested ecosystems" (NOMI, 2004, Appendix K, p. 8). To best deal with the varying degrees of connectivity in the study area, a flexible, three-level system of linkages was employed;

> By using a variety of linkage types that includes both strips of forest, wetland and field habitat as well as stepping stones or patches of habitat that provide resources and assist animals in moving across a landscape, planners are better able to maintain connectivity at different spatial scales and take into account the mosaic of habitats now present at the site…Having a variety of linkage types provides options for a wide variety of species (NOMI, 2004, Appendix K, pp. 17-18).

Thus NOMI is planning for connectivity for a variety of species at a variety of scales using a variety of linkage types. The three-level system of linkages consists of,

> Level 1 Linkage is the highest functional connectivity, with existing habitats linked by similar ecosystem communities, for instance, two woodland areas connected via a forested hedgerow. Level 1 linkages are suitable for species intolerant of habitat disturbance and/or with low to moderate dispersal capacities.
>
> Level 2 Linkage also provides continuous connectivity, but habitats are linked by somewhat different ecosystem communities, for instance, two woodland areas connected via a wetland or a drainage feature. Level 2 linkages are suitable for some species utilizing the protective woodland areas and those with moderate to high dispersal capacities.
>
> Level 3 Linkages are between patches or stepping stones of habitat that provide resources for some species to move through the landscape. Level 3 linkages are suitable for species tolerant of disturbance in linkage and ones that are mobile with high dispersal capacities, typically birds, squirrels, etc. This level of linkage does not require a defined terrestrial corridor between the stepping stones. This type of linkage will be enhanced as drainage features are naturalized, with the planting of parklands and stormwater ponds, and as the urban woodland canopy develops (Stantec et al, 2004, p.32).

Thus the three-level system of linkages is designed to maintain functional connectivity for a variety of species at a variety of scales.

NOMI's plan for linkages also includes a 32-page section on planning for new roads, which discusses measures that can taken to mitigate the impact of new roads on ecological connectivity on the North Oakville East site, including wildlife crossing designs for the six target species of the North Oakville East lands.

Comparison of the Town's and NOMI's Approach:

The Town and NOMI have similar approaches, but with four distinct differences. Whereas NOMI assesses each linkage individually and employs a three-level system of linkages, the Town plans for 100 meter wide linkages at all locations. NOMI's approach protects existing linkages, while the Town protects existing linkages, creates new linkages, and in a few locations, proposes non-functional linkages. NOMI's design is based on six target species, whereas the Town does not specify target species. Finally, while NOMI's approach is consistently supported by scientific literature, no

scientific justification is given for the Town's 100 meter wide linkages. In fact, when this researcher cross checked the linkage references used in the Town's Subwatersheds Studies, none of the references actually supported the Town's use of 100 wide linkages in the study area. For example, the Town states that Henry at al. (1999) "reported that corridors should not be less than 100m wide, as this will not create any 'core' habitat for interior or sensitive species." This is false. Henry et al. (1999, p. 647) actually report that, "Landowners and land managers often ask what the minimum corridor width should be for wildlife. Although this may seem like a reasonable question, in reality, there is no magic width, above which wildlife thrives and below which they are nonexistent". The references were consistently misquoted, misapplied, and, perhaps, misunderstood. According to the scientific literature, the Town's proposed linkages are excessively and unnecessarily wide.

Table 7.2 compares the two approaches to linkages on the North Oakville East Lands. This comparison provides an excellent example of an issue raised in Chapter 2: landscape connectivity planning faces constraints in terms of interpretation. In this case, planners for the Town and NOMI, using the same background data and maps, came up with two landscape connectivity plans for the study area that are largely similar but have significant differences. These differences would have led to a very interesting debate had both Secondary Plans been submitted to the OMB.

Table 7.2. Approach to Linkages on North Oakville East Lands

NOMI	Town of Oakville
Flexible -Three-level system of linkages connecting habitat patches -Linkages assessed individually	Inflexible -100m wide linkages connecting habitat patches
Protects existing linkages between habitat patches.	Protects existing linkages between habitat patches. Creates new linkages between currently isolated habitat patches.
Linkage design based on requirements of six target species: white-tailed deer, red fox, deer mouse, Eastern garter snake, American toad and gray squirrel.	Species not specified.
Supported by scientific literature.	Not supported by scientific literature.

What types of planning strategies are employed: offensive, defensive, protective, or opportunistic?

Town of Oakville: According to Ahern's typology, the planning strategies employed by the Town's NOESP constitute an offensive strategy. An offensive strategy is based on a vision or possible landscape configuration, which requires restoration or reconstruction to rebuild landscape elements in previously disturbed or fragmented landscapes (Ahern, 2005). The Town's emphasis on creating new linkages represents a possible future landscape for the North Oakville East Lands that can only be realized through restoration. The offensive strategy requires the displacement or replacement of intensive land uses (e.g. urbanization, agriculture) with extensive land uses that "put nature back" into the landscape (Ahern, 2005). According to Ahern, this strategy is rarely practiced because it is expensive, uncertain and is often politically sensitive. According to the Town's Subwatersheds Studies Draft Analysis Report;

> The current lack of forested connections and gaps between forested blocks indicates that the feasibility of creating forested connections would require considerable plantings. The existing discontinuities created by roadways are also an impediment to creation of a continuous forested connection throughout the Study Area (Town of Oakville, 2003, p. 35).

Thus, by the Town's own estimation, their proposed strategy of creating linkages will be expensive and labour-intensive, with uncertain results.

North Oakville Management Inc. (NOMI): According to Ahern's typology, the planning strategies employed by the Town's NOESP constitute a defensive strategy. A defensive strategy is often employed when the existing landscape is already fragmented and core areas are already limited in area and isolated (Ahern, 2005). The defensive strategy seeks to control and stop the negative processes of fragmentation or urbanization (Ahern, 2005). The defensive strategy is often appropriate as a last resort but can also be described as reactionary and ineffective, if the root causes of negative landscape change remain active (Ahern, 1995).

Are alternative scenarios for landscape connectivity evaluated?

There were four alternative scenarios put forward at the Town's design charette, including the NOMI plan, as part of the public participation process. This was refined to two scenarios, that of the Town and that of NOMI. Ultimately, only the Town's scenario, in the form of the Secondary Plan, was put before the OMB since the NOMI landowners accepted the Town's approach during detailed negotiations. The NOMI landowners accepted the Town's interpretation, which involved much higher levels on non-developed land, in order to gain faster development approvals and higher density on other lands.

Is there a landscape connectivity plan?

Town of Oakville: Yes.

North Oakville Management Inc. (NOMI): Yes.

Is there a policy of adaptive planning and management?

Town of Oakville: The Town's Subwatersheds Studies includes an Implementation Report, which it refers to as a "living document" that can be refined using an Adaptive Environmental Management (AEM) approach;

> AEM means making decisions as part of an on-going process. Monitoring the results of actions provides a flow of information that may indicate the need to change a course of action or change the document. The management strategy also includes recommended policies that should be incorporated into Official Planning documents such as the NOE-SP. Over time, government policies on relevant issues, such as terrestrial systems and SWM, will evolve. This strategy should always be applied with reference to the most recent applicable policies (Town of Oakville, 2004, pp. 7-1 – 7-2).

However, the Town's NOESP does not mention a policy of Adaptive Environmental Management or any form of adaptive planning and management.

The planning period for the NOESP is from 2006 to 2021 and it will be reviewed, at a minimum, every 5 years. The NOESP states that a program shall be established by the Town, in consultation with the Region of Halton and Conservation Halton, to monitor the development in the Planning Area on an annual basis, in accordance with directions established in the North Oakville Creeks Subwatershed Study. Monitoring the proposed linkages will be difficult; however, as there are no specific purposes given for Town's linkages.

North Oakville Management Inc. (NOMI): The Implementation section of NOMI's NOESP includes a policy for environmental monitoring;

> The Town shall undertake regular monitoring of the health of the natural heritage/open space system within the North Oakville East

> Secondary Plan Area. The indicators to be monitored and the nature of the monitoring program (s) will be set out in the Subwatershed Study. (NOMI, 2004, p.39).

As noted by NOMI's Subwatersheds Study, the implementation of monitoring is initially often the responsibility of development proponents, while in the long term, the local municipality or conservation authority are responsible for monitoring and its funding. Similarly, the management of the Natural Heritage System will be the responsibility of the Town, not NOMI, and while the NOMI documents do make some recommendations for management, ultimately, it is the Town's responsibility.

7.3.4 Summary

This case study reveals that the urban development process in Ontario contains high levels of emphasis placed on the conservation of cores, buffers and linkages. Cores are relatively easy to define since they are outlined by identifiable ecological features, such as forests and wetlands. Buffers are placed adjacent to these cores. However, there can be significant differences amongst planners and ecologists in the interpretation of linkage theory as applied to land development.

The case study also reveals that the decision on which approach to linkages is accepted may take place during backroom negotiations, where multiple tradeoffs were made, rather than in open discussion or in front of an administrative tribunal. In this case, the final decision on the entire open space system, including cores, buffers, and linkages, was made by lawyers representing the various parties, not by ecologists. In fact, throughout the process the ecologists were largely prohibited from talking with each other.

The case study also reveals that approved linkage plans may not include all the necessary elements for long-term linkage success. The lack of target species and specific goals for the linkages in North Oakville will mean that monitoring will be very

difficult, as it will not be possible to create a monitoring plan that is based on the approved functions of these linkages. Stepping stone linkages, which are well recognized in the literature (Baum et al., 2004; Bennett, 2003; Minor and Urban, 2007; Hashimoto, 2007; Rahel et al., 2008; Van Langevelde et al., 2002; Williams et al., 2004) were not accepted in this case study. Only wide, on-the-ground linkages were approved. The case study reveals that it is possible for linkages to be approved that go nowhere and thus are not truly linkages. In this case, linkages were approved that were stopped by major, multilane highways with no plans given for redesigning the highways to improve linkage function.

The case study also reveals that the linkage concept can be used by municipalities to gain a considerable amount of open space land during the development process, probably in excess of that actually needed for linkage functions. In the North Oakville case study, some of the land identified by the Town of Oakville as linkages did not have linkage function. This suggests that the linkage concept may be abused so as to gain open space without the municipality having to buy the land. It also means that since that target number for occupation of the lands, 55,000 people, remained the same, the development that will occur will be of much higher density.

This case study is a good example of the difficulty of using linkage theory with an adversarial decision-making process. Given the lack of clarity of the theory as applied in specific situations, the final decisions rely on power politics.

7.4 Case Study: Raisin Region Conservation Authority Natural Heritage Strategy

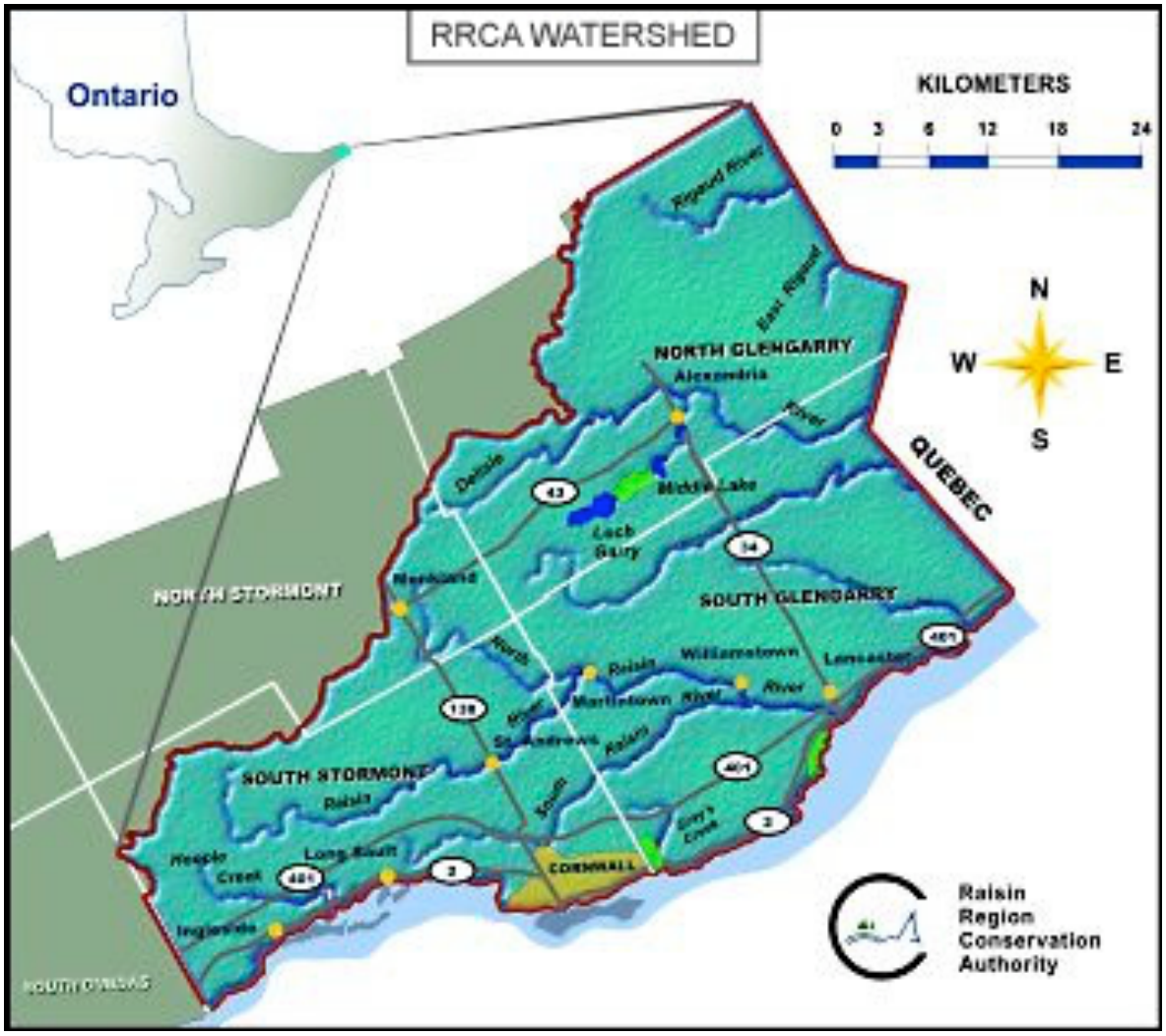
The Raisin Region Conservation Authority (RRCA) was formed in 1963 in Eastern Ontario, under the authority of the *Conservation Authorities Act*. Conservation authorities provide useful case studies in planning for landscape connectivity because

they operate on a watershed scale, rely on community support and participation, and are accustomed to cooperating with a variety of other agencies at multiple scales. The planning process for the RRCA's Natural Heritage Strategy is included here as a case study as it recognizes the critical importance of linkages to the watershed and the challenges of planning for linkages on predominantly private land (RRCA, 2005).

7.4.1 Study setting:

The RRCA watershed is located in Eastern Ontario, flanked by a provincial border to the east (Quebec) and an international border to the south (United States) (see Figure 7.2). The City of Cornwall, with a population of 45,965, is the largest populated area within the watershed (Statistics Canada, 2006). The total population within the RRCA watershed is approximately 82,000 people but it lies within one driving hour of the cities of Ottawa and Montreal, with a population base of over 3 million people. Agriculture dominates the region's economy, while forestry, mineral aggregate extraction, manufacturing, retail trade and high technology are also prevalent on a lesser scale (RRCA, 2005). Fragmentation of the forested landscape is a problem in the watershed, especially in the more heavily farmed areas.

Figure 7.2 Raisin Region Conservation Authority Watershed



The RRCA watershed includes the Raisin, South Raisin, North Raisin, Beaudette and Delisle River basins, along with secondary streams that connect with the St. Lawrence River (RRCA, 2007). The Canadian waterfront of St. Lawrence River is also part of the RRCA's jurisdiction. The watershed has been altered significantly since the arrival of the United Empire Loyalists, the first non-aboriginal settlers, in 1794. Over the years, the pioneers drained the abundant marshes and swamps and logged great quantities of hardwood forest, clearing the way for agriculture and degrading the watershed in the process. The RRCA's first conservation report noted, "This serious

destruction of a good water storage and flow system is the result of years of deforestation and swamp drainage without consideration to long-range consequences" (Department of Energy and Resources Management, 1966). Thus the watershed inherited by the RRCA in 1964 was already degraded and fragmented.

The RRCA watershed is located within eco-region (6E), which is Great Lakes-St. Lawrence mixed forest on limestone bedrock. The area is predominantly drained agricultural clay plains with small, fragmented forests and a few low drumlins (RRCA, 2006). The watershed has 36% woodland cover, with only 0.1% of consisting of old growth forest and 4% consisting of forest interior (minimum core area of 40 hectares) (RRCA, 2005). The watershed has only 8% wetland cover. The construction of roads, pipelines and hydro transmission corridors has fragmented wetland habitats, increased human disturbances and altered vegetation communities, water levels and water movement. Agricultural development, land use and drainage have greatly reduced the size, number and function of a majority of wetlands in the RRCA (RRCA, 2006).

Over 95% of the land within the watershed is privately owned. The remaining area is publicly owned through provincial parks, conservation areas, recreation areas, national parks, nature reserves, and conservation reserves that protect natural heritage values and provide recreational opportunities within the area (RRCA, 2006).

7.4.2 Planning History:

Conservation authorities are local watershed management agencies that deliver services and programs that protect and manage water and other natural resources in partnership with government, landowners and other organizations (Conservation Ontario, 2005). The RRCA has a mandate of "guiding our community in the protection, enhancement and restoration of our natural environment through programs that balance human and environmental needs for a sustainable future" (RRCA, 2005, p.1). The RRCA's Board

of Directors has eight members: two from the City of Cornwall, two from the Township of South Glengarry, two from South Stormont, one from the Township of North Glengarry and one from the Township of North Stormont. The Board of Directors is tasked with balancing the needs of their municipalities with the needs of the watershed.

The RRCA began the process of developing a Natural Heritage Strategy in November 2002. The impetus for this project can be traced to ongoing efforts to delist the St. Lawrence River (Cornwall) Area of Concern (AOC). The AOC, which lies within the RRCA's jurisdiction, was identified by the International Joint Commission as one of the most polluted areas around the Great Lakes. Identified disturbances within the AOC include fragmentation of forests and destruction of wetlands by residential, commercial and agricultural development; shoreline erosion; and seaway and dam construction; all of which have resulted in serious environmental degradation and loss of natural heritage features (RRCA, 2005). Fragmentation of forests has long been recognized as a problem in the area. The *Raisin River Conservation Report*, based on studies conducted in 1964, discussed the problem of fragmentation and recommended better woodlot management practices and the implementation of a reforestation of private lands assistance program (Department of Energy and Resources Management, 1966). In its description of tracts in farming areas "in need of return to tree cover", the report stated;

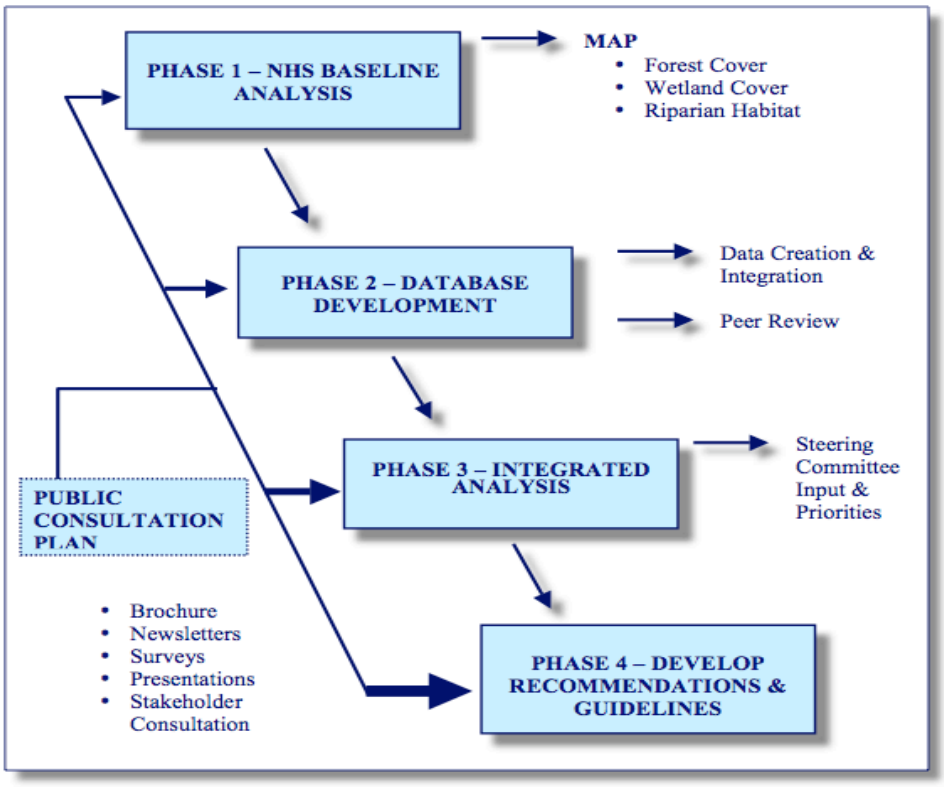
> Often such areas, though providing some shelter or erosion control, may contribute little to the individual farm, but when joined with others in a systematic fashion may, combined, perform a more useful function for the community as a whole (Department of Energy and Resources Management, 1966, p. 43).

This statement is an early recognition of the benefits of planning at the watershed scale.

The NHS addresses a number of Remedial Action Plan (RAP) recommendations for the AOC, such as restoring fish and wildlife habitat and providing a formal mechanism for the protection of natural heritage features in the region's land use planning process (RRCA, 2005). At a more comprehensive scale, the NHS is intended to assist the RRCA in fulfilling its mandate as it "supports the broad goal of working towards a healthy, fully functioning, diverse natural heritage system within the RRCA's jurisdiction" (RRCA, 2005, p.1). The main goal of the NHS is to identify and map the natural heritage system within the RRCA's jurisdiction and develop strategies to protect and enhance this system.

The NHS was developed through a four-stage process (see Figure 7.3). The end product of the NHS planning process was the *Natural Heritage Strategy for the Raisin Region Conservation Authority*, which provided recommendations and guidelines based on the results from the first three phases and from public consultation.

Figure 7.3 Natural Heritage Strategy Process



(Meek, 2003)

7.4.3 Comparison to Analytical Framework:

Is the planning process interdisciplinary and public?

The RRCA invited public participation in the development of the NHS through outreach programs including a community survey, open houses in each of the watershed's municipalities and presentations to special interest groups. Feedback from these programs was incorporated into the development of the NHS. However, the turnout for these programs was disappointingly low. The NHS was not contentious enough and did not capture public interest. Public acceptance and support of the NHS will be critical to its success, however, as almost all of the land in the watershed is privately owned.

The NHS was developed with the assistance of a wide range of partners, including representatives from academia, agriculture, forestry, municipal, county, provincial and federal government, industry, and NGOs. The partners were:

- Great Lakes Sustainability Fund
- Environment Canada
- St. Lawrence River Restoration Council
- Ontario Ministry of Natural Resources
- Townships of North Glengarry, South Glengarry, North Stormont, and South Stormont
- United Counties of Stormont, Dundas and Glengarry (S.D. &G.)
- City of Cornwall
- Ducks Unlimited
- Eastern Ontario Model Forest
- Domtar Inc.
- University of Ottawa
- St. Lawrence River Institute of Environmental Sciences
- Resource Stewardship of S.D. &G.
- Wetland Habitat Fund
- Cornwall Lunker Club
- Ontario Federation of Anglers and Hunters
- Cattleman's Association
- Glengarry Federation of Agriculture
- Mohawk Council of Akwesasne

These partners were invited to join the Natural Heritage Strategy Steering Committee, which was amalgamated with the Watershed Advisory Group in 2006. The Watershed Advisory Group provides RRCA staff with local perspective and knowledge, provides feedback on watershed initiatives, and facilitates the transfer of information between stakeholder organizations and the RRCA (RRCA, 2007).

Are landscape connectivity goals and assessments defined?

Landscape connectivity goals and assessments are not specifically defined.

What approach to linkage identification and design is employed?

With the exception of riparian corridors, there was no linkage identification undertaken.

What types of planning strategies are employed?

The NHS focuses on protection, restoration and enhancement. Priorities for protection include:

> All natural heritage features and areas within the AOC
> All natural heritage features and areas on RRCA lands,
> All provincially significant natural heritage features and areas
> All wetlands on provincial, county, municipal or RRCA lands
> All riparian corridors on provincial, county, municipal or RRCA lands
> Sensitive fish spawning habitats in wetlands, rapids and cool streams
> Old growth forest (existing and potential stands) (RRCA 2006, p. 20).

As linkages are identified as a natural heritage feature by the NHS, this means that all linkages within the AOC, all linkages on all RRCA lands, and all riparian corridors are priorities for protection. Specific priorities for restoration and enhancement are not listed in the NHS but will be determined based on historic conditions, current land uses and surrounding environmental conditions and ranked according to a set of criteria based on watershed health and socio-economic factors.

According to Ahern's typology, the RRCA's protective planning strategies for the NHS are considered to be part of a defensive strategy. The existing landscape, in this case the RRCA watershed, is already in a spatial configuration that is negatively impacting abiotic, biotic or cultural resources and the defensive strategy seeks to control and stop the negative processes of landscape change (Ahern, 1995; Ahern, 1999). The RRCA's restoration and enhancement strategies, however, are considered to be part of an offensive strategy in that they represent a possible future landscape that can only be realized through restoration (Ahern, 1999).

Are alternative scenarios for landscape connectivity evaluated?

No.

Is there a landscape connectivity plan?

A landscape connectivity plan has not yet been developed. However, the RRCA Implementation Polices for the NHS includes the following linkage policy,

> Linkages (including wildlife, valley, and riparian corridors) will be managed in an integrated program that recognizes their critical importance to the Natural Heritage System. The linkage program will provide guidance for linkage identification, management, and land securement (RRCA, 2005, p. 30).

Thus the NHS contains a commitment to develop a landscape connectivity plan.

Is there a policy of adaptive management?

The NHS was designed as a living document intended to change over time as new information emerges;

> The RRCA's Natural Heritage Strategy is designed to be adaptive and reflective. It is not a fixed document. Rather, it is a set of goals and objectives that will be shaped or refined as new environmental issues emerge that require action by the RRCA or their partners. The NHS is intended to be as much a process, as it is a document. In essence, the NHS should be considered a living document that will be changed from time to time in order to best address current natural heritage issues (RRCA 2005:7).

Thus, as the above quote describes, the planning process for the NHS is intended to be iterative and should allow for continuous process of evaluation and goals. The Future Work section of the NHS states that regular monitoring and reporting will be conducted on the status of the Natural Heritage System and a yearly work plan will be created for restoration and enhancement projects. It also states that the NHS will be reviewed periodically. The NHS report concludes by stating "The RRCA's NHS is a living document that will remain adaptive, reflective and open to change in a manner that recognizes that the protection and maintenance of natural heritage systems is an ongoing process" (RRCA, 2005, p. 34).

7.4.4 Summary

This case study reveals that this Ontario Conservation Authority has not yet developed a linkage policy, plan, or inventory. Even though forest fragmentation and connectivity was identified as a problem in 1966, this agency has not developed a comprehensive plan to deal with the issue. Beginning in 2002, this Conservation Authority started to address the issue of forest fragmentation and connectivity. However, even after 6 years of work the plan and inventory is not yet complete. This example shows that the connectivity principle has been recognized by this government agency, but there has been only partial progress in creating a comprehensive policy to deal with the issue.

7.5 Case Study: Oak Ridges Moraine Planning Process

The Oak Ridges Moraine (ORM) was the focus of an intense land use conflict in Southern Ontario that began in the 1980s and resulted in the passing of provincial legislation in 2001 (*Oak Ridges Moraine Conservation Act*) and a plan in 2002 (Oak Ridges Moraine Conservation Plan). The ORM case set an important precedent in Canada (and possibly the world) as it marked the first time that long, wide conservation corridors on private lands were regulated through land use legislation (Whitelaw and Eagles, 2007). The ORM planning process has received international attention (Parliamentary Commissioner for the Environment, 2003; Erickson, 2006; Noss and Daly, 2006; Whitelaw and Eagles, 2007).

7.5.1 Study Setting:

The Oak Ridges Moraine (ORM) is a glacial landscape feature located north of Toronto, stretching 160 kilometers from the Niagara Escarpment in the west across to the Trent River in the east (see Figure 7.4). The ORM is one of the last remaining large greenspace corridors in Southern Ontario (Erickson, 2006). Together with the

Niagara Escarpment, it forms the foundation of south-central Ontario's natural heritage and greenspace systems (MMAH, 2003). The ORM has important environmental, geological and hydrological features that make its ecosystem vital to south-central Ontario, including clean and abundant water resources, healthy and diverse plant and animal habitat, an attractive and distinct landscape, prime agricultural areas, and sand and gravel resources (MMAH, 2003). The ORM is often described as southern Ontario's "rain barrel" because it serves as an important water recharge/discharge area for many watersheds and provides drinking water to over 250,000 people (Natural Resources Canada, 2008; STORM, 2007). Over 100,000 people live within the ORM and 90% of the land is privately owned (Erickson, 2006). The central part of the Oak Ridges Moraine is adjacent to Canada's largest urban center, stretching from Oshawa in the west, through Toronto to Oakville-Burlington in the west.

Figure 7.4 Oak Ridges Moraine

(STORM, 2007)

7.5.2 Planning History:

This section presents a brief planning history of the ORM. For a detailed history and timeline, see Hanna and Webber (2005), Whitelaw (2005) and Parliamentary Commissioner for the Environment (2003). Increasing urban development pressures led local citizens and environmental groups to advocate for the protection of the ORM in the late 1980s. Save the Oak Ridges Moraine (STORM) Coalition was formed in 1989 and was influential in pressuring the Liberal provincial government to name the ORM a provincially designated significant area in July 1990 (Erickson, 2006; Whitelaw, 2005). Also influential were the results of new government studies, including the Royal Commission on the Future of Toronto's Waterfront *Watershed* report (1990) and *Space for All: Options for a Greater Toronto Area Greenlands Strategy* (1990), which recommended tighter provincial protection of the ORM and "highlighted the need for an ecosystem approach to planning in which connectivity is a fundamental principle" (Parliamentary Commissioner for the Environment, 2003, Appendix 2A).

The New Democratic Party was elected in September 1990 and in June 1991 they issued *Interim Guidelines: Provincial Interest on the ORM of the GTA*, which provided guidelines for reviewing development proposals on the ORM (Government of Ontario, 1991). Also in 1991, the Ministry of Natural Resources launched the comprehensive Oak Ridges Moraine Planning Study (Whitelaw, 2005). The Ministry of Natural Resources, Ministry of the Environment and the Minister of Municipal Affairs, together with STORM, Federation of Ontario Naturalists (FON), municipalities, conservation authorities, developers and the aggregate industry, formed the Oak Ridges Moraine Technical Working Group (TWC). The TWC assisted in the development of what was intended to be a basis for a regional approach to land use planning on the ORM, which would coordinate three regional governments and over a

dozen municipalities (International Association for Great Lakes Research, 2002). The TWC commissioned 15 background studies on the ORM. The TWC's three year planning study culminated in the *ORM Strategy for Greater Toronto Area,* which was released in 1994 but was subsequently shelved by the incoming Conservative government under Mike Harris in 1995 (Whitelaw, 2005).

In 1999, the Regions of York, Durham and Peel released *Towards a Long Term Strategy for the Oak Ridges Moraine*, a draft report that called on the provincial government to provide leadership for ORM protection (Parliamentary Commissioner for the Environment, 2003). Between 1999 and 2002, STORM, FON, and Earthroots worked together to draw the attention of the public, media, government and other environmental groups to the ORM (STORM, 2007). Scientists also became involved and, in February 2000, 465 scientists signed *A Protection Statement for the Oak Ridges Moraine* (Parliamentary Commissioner for the Environment, 2003).

In addition to the pressure from citizens, scientists and environmental groups, the intense media coverage given to the Town of Richmond Hill ORM Ontario Municipal Board (OMB) hearings in 2000, brought increasing pressure on the provincial government to protect the ORM (Hanna and Webber, 2005). The media, in particular the *Toronto Star* newspaper, began covering the ORM in 1995 as part of political reporting on the Conservative provincial government (Whitelaw and Eagles, 2007). Reporting intensified in 1999 when the Minister of Municipal Affairs, Steve Gilchrist, was accused of wrongdoing by the development sector and subsequently resigned (Parliamentary Commissioner for the Environment, 2003). The Town of Richmond Hill ORM OMB hearings received daily media coverage. The proposed urban development on the ORM had been approved by the Town but was objected to by the MNR, the Toronto and Region Conservation Authority, and environmental groups. The development would have limited future ecological connectivity across

southern Ontario from the Trent River basin to the Niagara Escarpment (Whitelaw and Eagles, 2007). Citizen opposition to this development was incredibly strong: 1,600 citizens crowded a Town Council meeting in February 2000 and the Town Council subsequently backed off its plans to support Moraine urbanization (Parliamentary Commissioner for the Environment, 2003).

The combined forces of environmental groups, individual citizens, opposition governments and intense media coverage prompted the provincial government to propose stricter ORM protection at the Town of Richmond Hill OMB hearings (Edey et al., 2006; Hanna and Webber, 2005; Whitelaw, 2005; Whitelaw and Eagles, 2007). The OMB hearings were stopped in mid stream when the government of the day introduced new legislation. The *Oak Ridges Moraine Protection Act* was passed on May 17, 2001 and established a six-month moratorium on development in the ORM. A multi-stakeholder ORM Advisory Panel was appointed by the provincial government to provide recommendations for ORM protection (Whitelaw, 2005). Their recommendations led to the *Oak Ridges Moraine Conservation Act,* enacted on December 14, 2001. Four months later, the Oak Ridges Moraine Conservation Plan was approved as a regulation under the new legislation (Parliamentary Commissioner for the Environment, 2003).

7.5.3 Comparison to Analytical Framework:

Is the planning process interdisciplinary and public?

Public pressure was instrumental to drawing government attention to the ORM planning process and public participation occurred throughout the planning process. The Citizen's Advisory Committee was established by the New Democratic Party government in March 1993 as companion to the Technical Working Committee and was chaired by STORM's Debbie Randall (Parliamentary Commissioner of the

Environment, 2003). The Citizen's Advisory Committee was formed to ensure that members of the public "be given a full opportunity to express their views and and provide input on the entire planning process" (Oak Ridges Moraine Technical Working Committee, 1992).

However, the public felt shut out of the Town of Richmond Hill OMB hearings. The developers spent millions of dollars on lawyers, scientific studies and expert witnesses. Citizens, environmental groups and even local councils did not have access to such resources (International Association for Great Lakes Research, 2002). As one participant described;

> As of today, we have no lawyer, no planner and no expert witnesses, which means we will just be blown away… The public has virtually no place there… The decisions that will affect millions of people over 200 years are being made in a room where the admission ticket is $1-million (Barber 2000).

This inequity is by no means unique to the ORM planning process, but the media coverage of the hearings brought the issue to the attention of a much larger audience than OMB hearings would normally receive. Strong public reaction prompted the provincial government to step in and suspend the hearings (International Association for Great Lakes Research, 2002; Hanna and Webber, 2005; Whitelaw, 2005).

Following the passage of the *Oak Ridges Moraine Protection Act* in May of 2001, an Advisory Panel was appointed by the Minister of Municipal Affairs and Housing to advise him on a plan for the ORM. This panel was composed of 13 members from stakeholder groups, plus a Chair, and included representatives from environmental groups, conservation authorities, regional governments and the development sector (MMAH, 2002; Whitelaw and Eagles, 2007). An Inter-Ministry Team of senior provincial government officials was also appointed to work with the Advisory Panel (MMAH, 2002). The Advisory Panel developed a series of recommendations for the ORM, which the MMAH incorporated in a public

consultation document. In August of 2001, the MMAH released *Share Your Vision for the Oak Ridges Moraine,* which was discussed by over 2,000 people attending public meetings and stakeholder sessions (MMAH, 2002). This document also prompted almost 600 written submissions via email, mail and the Environmental Bill of Rights Registry. These meetings and submissions were intended to provide an avenue for public participation in the development of legislation and a plan for the ORM.

The public continues to be involved, following the passage of the ORM legislation and plan. The Monitoring the Moraine (MTM) is a collaborative project between Storm, Community Environment Watch and Centre for Community Mapping, designed to engage and sustain community volunteers in science, stewardship, monitoring and decision-making on the ORM. The MTM project aims to "facilitate a more active and engaged role for citizens in municipal land use planning and environmental protection of the moraine" (Monitoring the Moraine, 2006).

Are landscape connectivity goals and assessments defined?

The ORMCP addresses abiotic, biotic and cultural goals for landscape connectivity. The Ontario government's vision for the Oak Ridges Moraine, as stated in the ORMCP, is that of "a continuous band of green rolling hills that provides form and structure to south-central Ontario, while protecting the ecological and hydrological features and functions that support the health and well-being of the region's residents and ecosystems" (MMAH, 2003). Thus a major landscape connectivity goal of the Plan is to protect the Moraine itself as a landform feature.

Biotic goals for landscape connectivity are addressed in the policies for Natural Core Areas, Natural Linkage Areas and Countryside Areas. For example, each of these sections includes a policy which states the purpose of Natural Core Areas, Natural Linkage Areas and Countryside Areas is to maintain and where possible improve or

restore the ecological integrity of the Plan Area, by;

> (a) maintaining, and where possible improving or restoring, the health, diversity, size, and connectivity of key natural heritage features, hydrologically sensitive features and the related ecological functions;

Thus maintaining and, where possible, improving and restoring connectivity of natural heritage features and functions is identified as a goal of the ORMCP. Policy 12(1) goes into further detail, stating that the purpose of Natural Linkage Areas is to maintain, and where possible improve or restore, the ecological integrity of the Plan Area, and to maintain, and where possible improve or restore, regional-scale open space linkages between Natural Core Areas and along river valleys and stream corridors, by;

> a) maintaining, and where possible improving or restoring, the health, diversity, size, and connectivity of key heritage features, hydrologically sensitive features and the related ecological functions;
> b) maintaining, and where possible improving or restoring natural self-sustaining vegetation over large parts of the area to facilitate movement of plants and animals;
> c) maintaining a natural continuous east-west connection and additional connections to river valleys and streams north and south of the Plan Area;
> d) maintaining the quantity and quality of groundwater and surface water;
> e) maintaining groundwater recharge;
> f) maintaining natural stream form and flow characteristics; and,
> g) protecting landform features.

Thus, the ORMCP identifies the facilitation of plant and animal movement as a biotic goal for landscape connectivity. However, no particular species were named in the ORMCP, nor were any data on animal movement along the Moraine explicitly considered (Noss and Daly, 2006).

Natural Core Areas, Natural Linkage Areas and Countryside Areas also have the shared objective of accommodating a trail system through the Plan Area and trail

connections to it, and thus a cultural goal for landscape connectivity in the ORMCP is the establishment of a trail system for recreational purposes.

What approach to linkage identification and design is employed?

The ORMCP uses an intuitive approach to linkage design. The spatial concept employed is the Natural Heritage System approach. A background study to the Oak Ridges Moraine Strategy for the Greater Toronto Area (ORM Technical Working Committee, 1994) provided a detailed approach to the development of a Natural Heritage System for the GTA portion of the ORM. This study defined and mapped a Natural Heritage System in which three criteria were used to select natural corridors:

> Select all streams and creeks which intersect nodes (cores) along with a 30m area along each side of the stream.
> Select all contiguous natural and plantation forests which serve to connect core areas to core areas and core areas to stream corridors.
> Select continuous or recurring patterns of slopes exceeding 10% which serve to connect core areas, stream corridors, and forested corridors. (Geomatics International, 1993, p. 27-28).

The resulting Natural Heritage System proposed by Geomatics International consisted of 22.2% core areas and 4% natural corridors. The study is based on conservation biology principles and contains an excellent discussion of advantages and disadvantages of corridors and the role of corridors in the natural heritage framework. Included are several points key to linkage design:

- The creation of new corridors must be undertaken with a clear understanding of what is being achieved and what risks are being taken. Setting objectives for specific corridors, based on site-specific data, is paramount if each corridor is to function ecologically.
- The maintenance and creation of linkages does not constitute full restoration of the landscape but rather should be viewed as a management exercise that

will facilitate the retention of some ecological processes and enhance ecological integrity.

- The development context in which corridors are planned should be considered.

This initial work was further built upon with the OMNR's A Natural Heritage System for the Oak Ridges Moraine: Cores and Conceptual Linkages for the Greater Toronto Portion (OMNR 2000). This study situated the ORM within a regional, rather than local, context and proposed major east-west linkages that were to be a minimum of 2km. wide (Whitelaw and Eagles, 2007). The actual Natural Heritage System in the ORMCP consists of 38% core areas and 24% natural corridors. This is a large increase from the 22.2% core areas and 4% natural corridors proposed by Geomatics International in 1993. Whitelaw and Eagles (2007) suggest that this increase indicates that conservation biology had become more sophisticated and conservation biology supporters had become more effective at influencing decision-making.

Although the ORMCP contains a detailed approach to maintaining connectivity, it also allows for alternative approaches. ORMCP Technical Paper 3-Supporting Connectivity, states;

> Notwithstanding any of the foregoing, an approval authority may develop and design an alternate approach in consultation with the local conservation authority and/or Ministry of Natural Resources to maintaining connectivity provided:
> · it is developed on a comprehensive ecosystem or municipal-wide basis;
> · it is based on sound ecological principles and practices that will achieve connectivity for plant and animal movement; and
> · a clear and effective implementation system is in place.

Thus the ORMCP allows for alternative approaches to implementation of landscape connectivity.

What types of planning strategies are employed: offensive, defensive, protective, or opportunistic?

According to Ahern's typology, the planning strategies employed by the ORMCP constitute a defensive strategy. As discussed previously, the defensive strategy is often employed when the existing landscape is already fragmented, and so the defensive strategy seeks to control and stop the negative processes of fragmentation or urbanization (Ahern, 2005). In the case of the ORM, development was threatening the ecological integrity of the Moraine, including landscape connectivity. The ORMCP identifies and maintains, improves or restores, in a natural self-sustaining vegetated state, all key natural heritage features and hydrologically sensitive features that have been identified for the role they serve in connecting or linking ecological features or functions within the ORM. This includes a policy for restoring natural self-sustaining vegetation over large areas of the linkage in order to facilitate movement of plants and animals (see ORMCP Policy 12(1)(b)).

Are alternative scenarios for landscape connectivity evaluated?

The ORM Advisory Panel evaluated numerous conservation biology-based scenarios and proposed protection of core areas and long, wide corridors (Whitelaw and Eagles, 2007).

Is there a landscape connectivity plan?

Yes.

Is there a policy of adaptive planning and management?

The ORCMP employs an adaptive approach. The ORMCP states that the Government of Ontario will: 1) in consultation with municipalities, identify performance indicators

for monitoring effectiveness of the Plan; 2) with appropriate stakeholders, establish a monitoring network to collect, summarize and evaluate performance indicator data to assess changes in the Moraine's ecological integrity, assess the effectiveness of the Plan's policies in achieving the Plan's vision and goals, and help identify improvements to address problems encountered in implementing the Plan.

Thus the Government of Ontario plans to monitor the implementation, impacts and effectiveness of the ORMCP's policies, while actively seeking solutions to potential problems. As noted by Whitelaw (2005), initiatives such as Monitoring the Moraine, which is developing a comprehensive monitoring program to track policy decisions and generate data for the ORMCP ten-year review, will facilitate engagement and increase the likelihood of long-term adaptive management. The ORCMP Plan Review and Amendment section states that;

> (a) The Plan is a long-term strategic plan that shall be formally reviewed once every 10 years and, if appropriate, amended to:
> -include ***new, updated, or corrected information***;
> -***improve the effectiveness and relevance of its policies***;
> -reflect changed or new priorities of the Ontario government.
> (b) The 10-year review ***shall not consider removing land from the Natural Core Areas and Natural Linkage Areas***.
> (c) A 10-year review of the Plan shall consider:
> -the need to change or refine the boundaries of the Countryside Areas and Settlement Areas;
> -the continued effectiveness and relevance of the Plan's vision, purpose, objectives and policies;
> -the effectiveness of the Plans policies in meeting the Plan's vision, purpose, objectives;
> -new, updated or corrected information;
> -***new science, technologies, or practices*** that shall improve the Plan's effectiveness;
> -any other matter that the Ontario government deems appropriate (MMAH, 2003, p. 10).

Thus the ORMCP will be reviewed every 10 years in order to include new information, new science, technologies or practices, to improve the effectiveness and relevance of its policies and to ensure that the Plan itself is effective and relevant. These are all signs of adaptive planning and management and should help with the

implementation of the ORMCP's landscape connectivity policies. However, as noted by Whitelaw (2005), the above statement also reveals a policy flaw in the ORMCP which may limit its adaptive abilities: the core and linkage designations cannot be decreased through future plan reviews, which could limit the Plan's adaptive qualities should new information require changes to the core and linkage areas.

7.5.4 Summary

This case study reveals that the Provincial Parliament has recognized, through the enactment of this special purpose legislation, the value of linkages. This concept was incorporated into law that directed a plan be developed that provided detailed policies on the function, location and management of linkages. This law and policy is globally significant because it may be the first time that long, wide conservation corridor on private lands were regulated through land use legislation (Whitelaw and Eagles, 2007). This is an unambiguous signal that the theory of linkages has been applied in law, policy, plans, and management over a very large area. What is doubly significant is that the linkages outlined in the Oak Ridges Moraine Plan would be worth billions of dollars if the land was allowed to be developed. In this case study, environmental protection and, perhaps, the value of ecosystem services provided by the ORM, were identified as being more important that economic development.

7.6 Case Study: Lands for Life Planning Process

The Lands for Life (L4L) planning process was an extensive regional land use planning exercise carried out by the Government of Ontario between February 1997 and May 1999 (OMNR, 1999). The goal of L4L was to develop regional land use strategies for over half of the province's Crown lands, where most resource and recreational

demands are made (NRTEE, 2003). Four objectives were established at the beginning of the planning process:

> Completing Ontario's system of parks and protected areas
> Recognizing the land use needs of the resource-based tourism industry
> Providing forestry, mining, and other resource industries with greater land use and resource certainty
> Enhancing angling, hunting, and other Crown land recreation opportunities (OMNR, 1999).

The end product of the L4L planning process was the *Ontario's Living Legacy Land Use Strategy*, a guidance document that set a framework for future land and resource management on Crown lands in the planning area (OMNR, 1999). It serves here as an example of the provincial government's approach to regional land use planning on Crown land in the late 1990s. There has been no similar comprehensive Crown land use planning effort in the 20 years since the OLL strategy was released (OMNR, 2009).

7.6.1 Study Setting:

The L4L planning area encompasses almost half of the province of Ontario, stretching from Northwestern Ontario's border with Manitoba across to Northeastern Ontario's border with Quebec (see Figure 7.5). The planning area consists of 39 million hectares of Crown land and 6 million hectares of private lands, federal lands and First Nations lands. This area consists of Ontario's most heavily forested region and includes the southern half of the boreal forest (National Round Table on the Environment and the Economy, 2003). The planning area features 32 natural regions and provides habitat for many plant, animal, bird and fish species (National Round Table on the Environment and the Economy, 2003). The planning area was divided into three sections: Boreal West, Boreal East and Great Lakes St. Lawrence. These sections represent broad ecological distinctions within Ontario's landscape (Chipeniuk, 1999).

Figure 7.5 Lands for Life Planning Area

(mhhe.com/biosci/pae/es_map/articles/article_19.mhtml, 1999)

The planning area falls within the traditional territories of the Nishnawbe Aski Nation and Treaty 3 and 5 nations, which include 48 aboriginal communities representing over 30,000 people (National Round Table on the Environment and the Economy, 2003). Forestry and mining were the predominant industries in the area, although the number of jobs they provided were decreasing significantly in the time before the L4L process while the numbers of jobs provided by resource-based tourism was rapidly increasing (National Round Table on the Environment and the Economy, 2003).

7.6.2 Planning History:

During the early 1990s, there was great competition for Northern Ontario's resource base between forestry, mining, tourism, hunting, fishing, and wilderness protection advocates, which raised public awareness of natural resource management and the allocation of resources to industry (National Round Table on the Environment and the Economy, 2003). Within the L4L planning area, only 6.6% of the land was protected in federal or provincial parks and virtually all lands outside of the parks was licensed for forestry, mining, hydroelectric development, or aggregate extraction (National Round Table on the Environment and the Economy, 2003). Most of the land had been allocated piecemeal to forestry, with little public input. A 1995 judicial review concluded that the Government of Ontario was not properly implementing forest planning and called into question roughly 80 forest management plans (National Round Table on the Environment and the Economy, 2003).

The Government of Ontario announced the Lands for Life planning initiative in February 1997. Conservative Premier Mike Harris declared, "Lands for Life is about long-term protection and conservation" (OMNR, 1997). The news release stated that the Lands for Life Program was based on the following principles:

- A land use planning process that ensures environmentally sound management of natural resources.
- A complete parks and protected areas system through a new initiative called Nature's Best, that will protect the best examples of Ontario's features.
- Involvement of interested parties- Aboriginal peoples, environmentalists, tourism operators, recreational users and resource-based workers.
- A Resource-Based Tourism Policy that promotes growth and prosperity in Northern Ontario.
- Maintaining the requirement that forest companies must follow tough standards for sustaining forests.

- Protecting habitat for wildlife, fish and endangered species (OMNR, 1997b).

The first phase of the planning process involved the establishment of citizen Round Tables whose members were to study their respective regions, share information among themselves and with OMNR and invite the public to provide information and feedback on proposals for Crown land use and resource management (OMNR, 1997c). At the end of this first phase, the Round Tables were to present recommended planning options for government review and public consultations. In the second phase, the Minister of Natural Resources was to review the final recommendations and develop a Regional Land Use Strategy, based on the Round Table recommendations, to direct future resource management operations and more detailed planning within the region (OMNR, 1997c).

In June 1997, 41 representatives were appointed to three Regional Round Tables for Boreal West, Boreal East and Great Lakes-St. Lawrence, respectively. Each Round Table member was required to reside in the region he or she represented and the Round Tables were described as including environmentalists, aboriginal peoples, tourism operators, foresters and concerned citizens who had been selected via a nomination process that took place in March and April 1997 (OMNR, 1997c). On October 16, 1997, the Government of Ontario bowed to public demand and announced that residents of southern Ontario would also be given the opportunity to participate in the L4L process, via a series of public meetings in late 1997 and early 1998. Following public consultation and hearings, the Round Tables presented their recommendations to the Government of Ontario in the summer of 1998. The Government then posted Lands for Life: Consolidated Recommendations of the Boreal West, Boreal East and Great Lakes St. Lawrence Round Tables on the Environmental Bill of Rights Registry for a 30-day public response period in fall of 1998 (Appleby et al., 2004). In brief, the

Round Tables recommended only a minor increase in the system of protected areas and suggested opening existing protected areas to industrial development (Appleby et al., 2004).

The public response to the Round Table recommendations was so overwhelmingly negative, that the Government opted not to proceed as they had first planned. Instead, the Government of Ontario entered into "closed door" negotiations with three of the largest forestry tenure holders and the newly formed Partnership for Public Lands, a coalition of environmental organizations (Appleby et al., 2004). First Nations, the public, and the mining industry were excluded from the table. These controversial negotiations resulted in the Ontario Forest Accord, released in March, 1999. Included in the Ontario Forest Accord was the commitment to protect 12% of the planning area as parks and protected areas. This commitment represented an addition of 2.4 million hectares to Ontario's system of protected areas, but without an increase in cost or reduction in supply to the forest industry through the creation of these new protected areas (Appleby et al. 2004).

On March 29, 1999, the Minister of Natural Resources John Snobelen released Ontario's Living Legacy Land Use Strategy and stated that the government had "completed the Lands for Life process and achieved its goals" (OMNR, 1999, p.1). The OLL Strategy claimed to have made the following progress towards completing the four objectives established at the beginning of the planning process.

The first was completing Ontario's system of parks and protected areas within the case study area. The total planning area was divided into four Land Use Designations (provincial park, conservation reserve, forest reserve and general use) and seven types of Enhanced Management Areas (including natural heritage, recreation, remote access, fish and wildlife, Great Lakes coastal, resource-based tourism and

intensive forestry). At total of 378 new parks and protected areas totalling 2.4 million hectares were proposed, which doubled the size of the protected area system.

The second recognized the land use needs of the resource-based tourism industry. Existing forest management guidelines for the protection of tourism values were revised. A new process for Resource Stewardship Agreements (RSAs) will be created. RSAs will focus on issues such as the method and timing of forest management and the location, construction, management and possible retirement of forest access roads. A dispute resolution process was to be developed.

The third was to provide forestry, mining, and other resource industries with greater land use and resource certainty. The MNR was directed to work with other sectors to develop a plan to increase forest industry productivity through sustainable forest practices. The Government of Ontario was to implement a compensation program for areas removed from forest licences for forest industry. A more flexible approach to mineral exploration in protected areas would address the need of the mining sector to keep land open for exploration. The new Living Legacy Trust was to support resource industries and communities by allocating funds, improving multi—purpose resource access, developing new forestry opportunities in the north, and increasing forestry jobs by increasing quantity and quality of wood supply from Crown Forests.

The fourth concerned enhancing angling, hunting and other Crown land recreation opportunities. There was to be increased fish production in provincial hatcheries. There were to be regulatory changes to open more lakes to year-round fishing and expand deer hunting season. Sport hunting and commercial trapping was to be allowed in all new protected areas, except nature reserves. The new Living Legacy Trust will provide funds for improving fish and wildlife habitat, and increase access to hunting.

Thus, although the OLL Strategy created new protected areas, it also allowed for continued resource extraction in most areas. Seventy per cent of the planning area was designated for general use and there is no coordinated management regime to maintain ecosystem integrity (Appleby et al. 2004). This is a very serious concern for landscape connectivity because, as one highly critical article described;

> The implementation of Lands for Life will create a landscape of disparate protected islands, set in an industrial sea of mining activities, clearcuts, and chemical-intensive tree farms. This does not bode well for the preservation of ecological functioning or the movement of species. Patches that are too small are generally shown to lose both. This is especially so since the total amount of protected area, with additions, still adds up to only 12 per cent of the landscape (Weis and Krajc, 1999, p. 34).

While this quote paints an exceptionally bleak picture, it does have a valid point about the "landscape of disparate protected islands" in a potentially hostile matrix. The Lands for Life process missed an opportunity to address landscape connectivity at a scale never before seen in Ontario. In conclusion, however, it is very important to note that all of the forested Crown Land in the planning area had already been allocated to industry and, as such, each new protected area represented a "clawback" from industry, all of which would most likely have been logged in the near future (Appleby et al., 2004). In that light, it can be seen as making the best of a difficult political situation and the limited connectivity that resulted from the process is certainly better than what would have resulted from the Round Table's original recommendations.

7.6.3 Comparison to Analytical Framework:

This analysis focuses on the L4L land use planning process between 1997 and 1999 and its end product, *Ontario's Living Legacy Land Use Strategy*.

Is the planning process interdisciplinary and public?

The OMNR described the L4L planning process as the most ambitious public involvement initiative it had ever launched (OMNR, 1999). Studies of the L4L planning process, however, are highly critical of its public component (Appleby et al, 2004; Canadian Environmental Law Association, 1999; Chipeniuk, 1999; National Round Table on the Environment and the Economy, 2003). For example, Appleby et al. (2004, p. 10) describe the public component of the L4L planning process as "deeply flawed from the outset", for the following reasons:

- There was very little public awareness that the process was ongoing.
- Initially, only input from within the planning area was invited.
- The vast majority of Ontarians were excluded from the process, until significant protests forced the provincial government to schedule hearings in southern Ontario.
- The Round Tables were skewed to logging and mining interests and included no scientists or provincial conservation organizations.
- Aboriginal peoples withdrew early in the process, claiming that their concerns about land stewardship, jurisdiction, treaty and Aboriginal rights were being ignored.
- The intent to base decisions on consensus fell apart and there was no mechanism in place for settling disputes.
- The recommendations of the Round Tables did not reflect public will.
- The public overwhelmingly rejected the Round Table recommendations.

The recommendations of the Round Tables called for an expansion of the industrial land use of the planning area and a minimization of protected areas (National Round Table on the Environment and the Economy, 2003). *Lands for Life: Consolidated Recommendations of the Boreal West, Boreal East and Great Lakes St. Lawrence Round Tables* was posted on the Environmental Bill of Rights registry on October 30, 1998 and, despite a short 30-day comment period, received a record 14,000 comments, the "vast majority" of which rejected the recommendations (National Round Table on the Environment and the Economy, 2003). The public, largely from Southern Ontario, was outraged that the Round Tables had failed to meet their main objective: to complete the provincial protected areas system. Indeed, their much-touted

public consultation process was such a failure that the Government of Ontario abruptly changed the approach and switched to closed-door meetings instead.

The skewed composition of the Round Tables contributed to their failure not only to create recommendations that were acceptable to the people of Ontario but, of relevance to this thesis, to create recommendations that would benefit landscape connectivity. The Round Tables were skewed towards logging and mining interests centered in Northern Ontario and did not include scientists or provincial conservationist organizations (Appleby et al., 2004; Marcolongo, 2001). As noted by Chipeniuk (1999, p. 12), "Some stakeholders have a large stake in turning society away from the very idea of environmental degradation, much less the causes thereof".

Following the release of the Round Table recommendations, the Partnership for Public Lands coordinated an urgent appeal to the international scientific and academic community to read, sign and forward the *Collective Statement of Conservation Concern from the Scientific and Academic Communities Regarding Lands for Life, Ontario, Canada.* Along with comments on the importance of biodiversity and the establishment of protected areas systems, the statement noted that the principal causes of wildlife extinction and population decline are "loss and fragmentation of wild habitat by widespread industrial development"; and it concluded;

> We, the undersigned, wish to convey our collective dismay that Ontario's Lands for Life Round Tables have ***been unable to bring modern science to bear on the urgent issue of ecosystem protection*** and failed to recommend completion of a permanent protected areas system representing Ontario's landscape diversity. Accordingly, we call on the Government of Ontario to reject the Round Tables' recommendation to permanently protect only an additional 1.6% of the planning area. Rather, we urge the Government of Ontario to complete, as promised, a protected areas system that is fully representative of Ontario's diverse ecosystem types. ***Such a system must utilize accepted scientific principles of protected areas design*** and accepted precautionary principles which, we believe, will require that at least 20% of the planning area be permanently protected.

This statement was signed by 1252 scientists from around the world. Clearly, the scientific community felt the Round Table recommendations did not accurately reflect current scientific thinking.

The next phase of the L4L process was not public. According to Weis and Krajic (1999, p. 34),

> In short, the Harris government used an unfair, unrepresentative blitzkrieg approach. This ensured that the process would be hijacked by industrial interests. The secrecy and lack of consultation inherent in this agreement left little room for public involvement, debate and discussion -- in complete contradiction to the promises made by the government at the outset that the process would herald a new era of public involvement in land use planning.

Not surprisingly, the public and the excluded environmental groups were upset over being left out of the negotiations and highly critical of the government's tactics.

Are landscape connectivity goals and assessments defined?

Landscape connectivity goals and assessments were not defined in the OLL Strategy.

What approach to linkage identification and design is employed?

There was no linkage identification undertaken.

What types of planning strategies are employed: offensive, defensive, protective, or opportunistic?

According to Ahern's typology, the planning strategy employed by L4L is opportunistic. With this strategy, the landscape contains unique elements or configurations of elements that may or may not be optimally located but represent positive opportunities for landscape planning (Ahern, 1995; Ahern, 1999). In this case, one objective of the L4L planning process was completing Ontario's system of parks and protected areas. Significant progress was made towards representing forest types

and many ecologically valuable sites were chosen for protection, including 36 river corridors (Appleby et al., 2004). While some of the new protected areas do provide connectivity, many of the new protected areas are small, isolated patches of habitat. As noted by the National Round Table on the Environment and Economy;

> However, while the protected areas system resulting from the Living Legacy provides some connective corridors between protected areas, particularly north of Lake Huron and Lake Superior, it is still more of a patchwork approach to protection than a conservation biology approach. Neither the round table process nor the one-on-one tradeoffs achieved by the PPL and the forest industry lent themselves to a strategic effort to achieve a comprehensive conservation plan (2003, p.11).

Clearly, the L4L planning process did not apply a conservation biology approach to designing the protected areas system, and it does not appear that landscape connectivity was given much concern during the selection of new protected areas. As a result, it is highly unlikely that viable populations of all native species will be maintained in natural patterns of abundance and distribution in the planning area (Appleby et al., 2004).

Are alternative scenarios for landscape connectivity evaluated?

No.

Is there a landscape connectivity plan?

No.

Is there a policy of adaptive planning and management?

No.

7.6.4 Summary

This case study revealed that land use planning and regulation in Northern Ontario is centered on the protection of high value ecological areas through the creation of provincial parks and conservation reserves. There is scant attention given to linkages. This approach was developed in the 1990s and has not been revised since that date. The issue of connectivity will become increasingly relevant to Northern Ontario as direct pressures from human development increase and indirect pressures from climate change alter the landscape. Carroll et al.'s (2003) study of grizzly bear and gray wolf populations concluded that "seemingly secure" boreal carnivore populations are inadequately protected from the foreseeable effects of human development. The results of their study further suggest that landscape connectivity may have the greatest effect at the range margin where formerly continuous populations are just beginning to become fragmented and before the landscape can be characterized by island-matrix models. It appears that the Province of Ontario may have missed an excellent opportunity to address landscape connectivity in the north when it failed to properly address linkages in the L4L planning process.

7.7 Summary

This section provides a summary and a comparison of the case studies (Table 7.1). The planning processes used for all was, to some degree, interdisciplinary and most were public. All three cases with an identified approach to linkage design took an intuitive, rather than an empirical or modeling approach, and they all used a Natural Heritage System concept. Planning strategies were mainly defensive, but also included opportunistic and offensive strategies. None were strictly protective which, as defined by Ahern (2005), is a proactive planning strategy that prevents fragmentation by

protecting the landscape from change. While the three cases in Southern Ontario were set in already fragmented landscapes and thus could not employ a protective strategy, the L4L case was set in a relatively intact landscape and could have used a protective strategy. The proactive planning of corridors before regional fragmentation takes place is more effective than trying to restore connectivity in a fragmented landscape (Noss and Daly, 2006). Alternative scenarios were used in the three cases that also had a landscape connectivity plan. Only two of the case studies had a clear policy of adaptive planning and management, which is again unfortunate as adaptive planning and management is critical for a concept like landscape connectivity that requires planning with uncertainty.

The case study which best fit the analytical framework was the ORM planning process. It employs an interdisciplinary and public planning process. It defines abiotic, biotic and cultural goals. It employs an intuitive, Natural Heritage System approach to linkage design and it uses a defensive planning strategy. Alternative scenarios for landscape connectivity were evaluated before developing a landscape connectivity plan. Finally, the ORMCP follows a policy of adaptive planning and management. The ORM planning process thus contains the key elements for successful planning and, indeed, it is used internationally as an example of conservation planning at the regional scale.

The case studies also revealed that the urban development process in Ontario places a high level of emphasis on conservation of cores, buffers and linkages but the same cannot be said for land use planning on Crown land, where the issue of connectivity is largely ignored.

7.8 Lessons for Planning

The comparative analysis reveals two additional themes in the landscape connectivity case studies, namely the role of science and the importance of political will. Science, and scientists, must play a key role in planning for landscape connectivity. Yet the case studies reveal one case where the science concerning landscape connectivity was ignored (L4L), one case where the science was misapplied (North Oakville), and two cases where lack of accessibility to science may have hindered participation in and results of the land use planning process (ORM and RRCA).

The science of landscape connectivity played a key role in the North Oakville East planning process but, ultimately, it was partially misapplied. The Town's Secondary Plan includes linkages that connect previously unconnected habitat patches, linkages that have no end habitat, linkages that have no ecological purpose, and linkages that are crossed by major barriers to wildlife movement. All of these proposed linkages are excessively and unnecessarily wide. None of this is supported by the science. This would be troubling enough but what makes this case problematic for landscape connectivity planning is that it has been lauded as precedent-setting by the OMB and the media. Board Member Campbell stated that the Town's approach "constitutes a superior and forward-looking method of protecting this Province's natural heritage" and that a systems approach is "clearly the best approach given what experts now understand about environmental biology". How ironic that the majority of the linkages in the Town's system have not been designed with the expert understanding that Campbell applauds. In fact, the entire linkage concept was not put in front of Campbell. She never heard evidence of the landowner's linkage plan and never heard the Town's experts being cross-examined. She only knew half of the case. An

article by the Toronto Star, following the OMB approval of the Town's Secondary Plan, states,

> Until now, the notion of "linked natural heritage" corridors has typically been an afterthought in planning GTA developments – or at least secondary to the goal of putting in as many housing units as possible. Smith said the ruling sends a message to other municipalities that linked-systems planning is here to stay (Toronto Star, January 17, 2008).

This would be a good message, indeed, except for the fact that some of the linkages in this case are so poorly designed. Beyond the poor design of the linkages, there was a perception, on behalf of certain landowners and others involved in the North Oakville case, that the Town's wide linkages were nothing more than a thinly-veiled land grab. There was also talk of leapfrog development and the ramifications of protecting, at great expense, such a large portion of an already disturbed and highly isolated site; which may only serve to push development onto a much more ecologically valuable and sensitive site elsewhere. Overall, while the message of linked-systems planning is good, any close inspection of the Town's linkages will reveal shoddy science, which may, in turn, cause planning for landscape connectivity to lose, rather than gain, ground in Ontario.

Science was also important in the L4L planning process. Although the L4L process was intended to take a scientific, ecosystem-based approach to long-term protection and conservation, the central concern of the L4L documents is conflict resolution among resource consumers, not diminution of the resource base itself (Chipeniuk, 1999). The OMNR announced, "With Lands for Life…all of us will know the conditions and requirements for ensuring the long-term health of Ontario's natural environment" (OMNR, 1997, p. 3). Chipeniuk, however, found that the Lands for Life planning products contain "nothing about specification of the causes behind degradation of regional environments" and that, in the Great Lakes-St. Lawrence

Round Table meetings, OMNR planners failed to ensure that members attend to evidence on causation and, as a result, the Round Table members did not attend to it (1999, p. 103). If the planning process fails to address the root causes of environmental degradation, it cannot hope to devise adequate or appropriate solutions. Accordingly, as the L4L planning process did not adequately address the root causes of environmental degradation, it is not surprising that the problem of landscape connectivity was not addressed. Despite its claim of being a science-based approach, scientists were, by and large, excluded from participating in the L4L planning process. Thus, although the L4L process had the potential to greatly impact landscape connectivity at a provincial scale, it was not truly based on a scientific approach and it did not identify landscape connectivity as a significant planning issue. Therefore, landscape connectivity is not adequately reflected in the *OLL Strategy*. It is possible to argue that the acceptance of linkage theory in planning has progressed considerably since 1999. Therefore, if it was possible to review the OLL Strategy in the future one might expect a much higher emphasis on linkages.

In the case of the ORM, both environmentalists and developers saw the issue as coming down to a matter of science, although the environmentalists thought the science proved that the Moraine could not be developed and the developers thought the science proved that the Moraine could be safely developed. Both sides attempted to use science to prove their point at the Richmond Hill OMB hearings but, ultimately, the developers had deeper pockets and thus better access to scientific expertise. As discussed earlier, the hearings were suspended by the Government but not before the issue of inequity before the OMB had been raised and promoted by the media, along with the concept of protecting the Moraine as a long, continuous corridor.

Science, or rather the lack of access to scientific expertise, also played a role in the RRCA's NHS and its landscape connectivity content. Although the NHS has strong

landscape connectivity content and contains a commitment to develop a landscape connectivity plan, the RRCA is hindered by financial constraints and a lack of specialized assistance. They do not have the in-house expertise to design a landscape connectivity plan and so it has been postponed indefinitely. This situation would likely be the rule, rather than the exception, for most small conservation authorities and municipalities in Ontario.

The RRCA's Natural Heritage Strategy (NHS) was developed during a time period in which the Chair of the RRCA's Board of Directors was actively pro-environment and very committed to "greening" the watershed. He was a supporter of the NHS and committed to implementing it both within his municipality and the larger watershed. There was a sense of urgency for completing the NHS and receiving approval from the existing Board before a new Board was to be appointed. Certain elements of the NHS, and perhaps even the NHS itself, might not pass the scrutiny of a less progressive Chair. The issue of landscape connectivity, for example, was not present in earlier phases of the NHS but was recommended by the planning consultant hired to complete the Phase Four NHS Report and, with the approval of the Chair and the consent of the rest of the Board, was added to the NHS and its policies. The NHS was approved by the Board of Directors in October 2005, with its landscape connectivity policies intact, thanks to the political will of the Chair.

Appleby et al. (2004) use the L4L planning process as an example of how political will can determine the outcome of a planning process. In the first phase of L4L, there was no solid political commitment to the goals of the process, confusion as to whether the targets were firm and, consequently, the Round Tables made recommendations that would have greatly reduced levels of protection in existing protected areas while making very small new additions to the protected areas system. In the second phase of L4L, the Conservative government was facing an upcoming

provincial election and had been made aware of how effectively the Partnership for Public Lands was able to mobilize support. Apparently not wanting to provoke environmentalists so close to election time, Premier Mike Harris made it clear that to the parties involved in the Ontario Forest Accord negotiations that they were to protect 12% of the planning area while ensuring that the establishment of new protected areas did not result in a reduction of the wood supply to the forest industry (Appleby et al., 2004). Had the Premier also instructed them to maintain landscape connectivity, it would undoubtedly have been given attention and the resulting OLL Strategy would have addressed landscape connectivity.

The ORM planning process is also an example of political will forwarding the concept of landscape connectivity. As discussed earlier, the combined forces of environmental groups, citizens, opposition governments and intense media coverage prompted the provincial government to propose stricter ORM protections, including designation of regional corridors. Supporters of the ORM also used this opportunity to link conservation biology with land use planning law and policy in Ontario (Whitelaw and Eagles, 2007). The ORM case brought the issue of landscape connectivity to the attention of Ontario's political decision-makers, who then put the concept into legislation.

7.9 Conclusion

This chapter examined four different case studies and compared them to a planning framework for landscape connectivity. The planning process for all was largely interdisciplinary and public. All three cases with an identified approach to linkage design took an intuitive, rather than an empirical or modeling approach, and they all used a Natural Heritage System concept. Planning strategies were mainly

defensive. Alternative scenarios were used in the three cases that also had a landscape connectivity plan. Additionally, the role of science and political will were found to have a great impact on the outcome of the case studies. Chapter 8 will conclude this dissertation with a presentation of the research findings, recommendations for the Government of Ontario, implications of the research for planning theory and practice, and directions for future research.

8 Findings, Recommendations and Conclusions

8.1 Introduction

This chapter 8 presents the research findings, recommendations for the Government of Ontario, implications of the research for planning theory and practice, and directions for future research. The research objectives of this dissertation were:

- To examine the application of the theory of landscape connectivity in Ontario's land use planning policy and practice between 1970 and 2008.
- To evaluate the degree to which there has been a movement from theory to practice in landscape connectivity planning in Ontario.
- To determine what circumstances facilitated the movement from theory to practice in planning for landscape connectivity.

These research objectives were met through a combination of literature review, content analysis, and case study research.

8.2 Research Findings

This research found that there has been a movement from theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008. Chapters 4 and 5 revealed that the concept of landscape connectivity was found in several land use planning documents in the 1970s and 1980s and, by the 1990s, was present in a range of government reports, regional and provincial strategies, and provincial policies. By 2008, the concept of landscape connectivity had fully moved from theory to practice and was well established within polices, programs and provincial legislation. Landscape connectivity is now an accepted part of planning for natural heritage in the province.

The research also found that the introduction of conservation biology principles created a growing public awareness, which contributed to rising pressure on the Government of Ontario to reform not only its land use planning policies but its entire land use planning system. Chapter 4 provided a history of the introduction of conservation biology principles to Ontario and described how a growing public awareness put pressure on the Government of Ontario to include these principles in their land use planning decisions. Chapters 5 and 6 demonstrated that landscape connectivity was increasingly being included in Ontario's law and policy, as a result of public pressure. There was not a single case in which the OMB argued against the value of landscape connectivity, although economic interests were sometimes considered more valuable to the public interest. Chapter 7 also confirmed that public pressure and political will were key factors in landscape connectivity case studies in Ontario.

The research found that Ontario's land use planning law and policy often does not provide explicit direction to planners. The content analysis in Chapter 5 revealed that the majority of the landscape connectivity statements in Ontario's planning law and policy are neutral in direction (52.9%), a third of the statements are advisory (29.6%), a small number of the statements are positive (14.4%) and very few statements are imperative (3.1%). This implies that Ontario's planning law and policy is not providing strong direction to planners on the issue of landscape connectivity. Chapter 5 further demonstrates that although planners in Ontario are expected to plan for landscape connectivity, the details of how exactly they should do so remain unclear. Detailed technical guidance is provided by the supporting documents but the use of these documents is discretionary.

The research identified that Ontario's land use planning law and policy portrays landscape connectivity as a positive or neutral concept. The content analysis in

Chapter 5 revealed that the majority of landscape connectivity statements in Ontario's land use planning law and policy portray the concept of landscape connectivity as either positive (43.9%) or neutral (54.9%). The only type of documents that mentioned either negative or both positive and negative aspects of landscape connectivity were Supporting and Guidance Documents, the use of which is discretionary. Maintaining and/or enhancing landscape connectivity is often good planning practice, but there are situations where landscape connectivity is not feasible or desirable.

In the last decade, provincial policies are, in general, being applied in favour of landscape connectivity. The comparative analysis in Chapter 6 revealed that, overall, the OMB is indeed having regard to landscape connectivity as a legitimate planning concern. In the majority of cases in which landscape connectivity was identified as a deciding factor, the OMB ruled in favour of protecting landscape connectivity. Even the concept of potential linkages was treated as a legitimate planning concern, which suggests that the provincial policy of "maintaining and improving connectivity, where possible", is indeed being given due consideration by the OMB.

It is clear that planning for landscape connectivity requires specialized expertise. The literature review in Chapter 2 revealed that landscape connectivity is interdisciplinary, deals with spatial, biological and temporal analyses at multiple scales and must include human influences. Planning for landscape connectivity is complex and requires specialized expertise, as was confirmed by the results of Chapters 5, 6 and 7. For example, Chapter 5 presented a quote from the NHRM stating, "An ecological specialist can assist a planning authority in developing a natural heritage system that meets its particular circumstances" (OMNR 1999, p. 40). This very simple, but important statement, acknowledges the complexity of planning for natural heritage systems and the need for specialized assistance. Land use planners, even with the detailed guidance provided by the NHRM and SWHTG, are not fully qualified to plan

for landscape connectivity. Chapter 2 noted that the theory of landscape connectivity is susceptible to misapplication. This was confirmed in Ch 7, where the North Oakville case study illustrated how the Town's landscape connectivity plan is not fully supported by science.

Chapter 6 demonstrated that although the OMB acknowledged the testimony of ecologists, they were granted non-professional status and the OMB preferred the testimony of expert witnesses. In one case, the testimony of an applied ecologist, who subscribed to the principles of conservation biology, was found by the presiding Board Member to be "earnest, sincere, principled and professional". The Board Member then described the witness as not being a qualified land use planner and, ultimately, the Board preferred the evidence of the many expert witnesses of the developers. The disregarding of an ecologist's evidence because he was not *also* a land use planner highlights an important problem for planning for landscape connectivity in Ontario. Planning for landscape connectivity requires specialized expertise from professionals trained in both conservation biology and land use planning. Access to such expertise may be limited by the number of such professionals practicing in Ontario and by the financial resources of planning authorities. Smaller municipalities, for example, would be unlikely to have such a planner on staff and may not have the financial resources to hire one when needed. This was further confirmed by the results of Chapter 7, where, for example, the RRCA wished to develop a landscape connectivity plan but did not have the professional resources necessary to do so. The law profession has addressed this issue by creating a specialized accreditation for environmental law. It appears that it would be desirable for the planning profession to do something similar.

The research found that landscape connectivity plans/projects in Ontario tend to employ intuitive, rather than empirical or modeling approaches, to linkage identification and design. In Chapter 7, all three cases with an identified approach to

linkage design took an intuitive, rather than an empirical or modeling approach, and they all used a Natural Heritage System concept. The OMB cases in Chapter 6 also employed intuitive approaches to linkage design, using the Natural Heritage System, ecosystem or precautionary approach.

The research identified that landscape connectivity plans and projects in Ontario tend to employ reactive, rather than proactive, approaches to maintaining connectivity. The case studies in Chapters 6 and 7 all employed reactive, rather than proactive, planning strategies for landscape connectivity. As discussed previously, taking a reactive approach to landscape connectivity tends to be more expensive and less effective than preventing the landscape from becoming fragmented.

8.3 Lessons for Planning Practice

This dissertation has examined how the theory of landscape connectivity has been applied in Ontario's land use planning policy and practice between 1970 and 2008. The research findings confirm that there has been a movement from theory to practice, so that landscape connectivity is now an accepted part of planning for natural heritage in Ontario. Oddly, the concept of linkage function is much better recognized and implemented on private land planning than within public land planning.

Lessons for Government: The findings suggest that there is room for improvement in the Government of Ontario's approach to planning for landscape connectivity. The following recommendations are based on the research findings. The recommendations are relevant to the Ministries of Municipal Affairs and Housing and Natural Resources, as well as partner ministries and agencies either involved with or whose actions impact land use planning in the province, such as the Ministries of Energy and Infrastructure,

Environment, Northern Development, Mining and Forestry, Transportation and the Niagara Escarpment Commission.

1) The Government of Ontario should plan for landscape connectivity at a provincial scale. The vision should be a provincial natural heritage system. There is currently a lack of consistency of application at the municipal level due to uneven resources, lack of funding and expertise. Landscape connectivity transcends municipal boundaries and must be planned for at a provincial scale. The Government of Ontario has taken recent steps towards provincially led land use planning (e.g. ORM, Greenbelt, Places to Grow). A provincially-led approach to landscape connectivity should include the following actions:

- The Government of Ontario should apply landscape connectivity theory and practice on Crown land throughout the province.
- The Government of Ontario should establish a provincial coordinator for landscape connectivity projects.
- The Government of Ontario should create a landscape connectivity advisory team from whom municipalities and other planning authorities can obtain information and advice on landscape connectivity issues.
- The Government of Ontario should ensure that the 10-year reviews of the Greenbelt Plan, ORMCP and NEP in 2015 do not lead to weakening of natural heritage policies**.**
- The Government of Ontario should increase support to large-scale landscape connectivity projects, such as the Natural Spaces Program and NOAH.
- The Government of Ontario should strengthen partnerships with environmental groups, such as Ontario Nature and Carolinian Canada,

which are working towards maintaining landscape connectivity throughout Ontario.

2) The Government of Ontario should create a guidance document specifically for landscape connectivity. There also needs to be a mechanism whereby planning authorities demonstrate that they have consulted this document. This document should:

- Address all types of linkages, not just animal movement corridors
- Address ecological processes
- Address functional, as well as structural, connectivity
- Address both positive and negative aspects of landscape connectivity

3) The Government of Ontario should revise the Provincial Policy Statement. The revisions should:

- Improve clarity of language
- Make monitoring mandatory
- Provide protection for regionally and locally significant natural heritage
- Provide performance indicators
- Make NHS approach mandatory
- Eliminate agricultural and aggregate resource exceptions
- Include all infrastructure in definition of "development"

Lessons for Professional Planners: Planning for landscape connectivity is an important task and the decisions made by today's planners will have profound consequences in the future (Bennett et al. 2006; Morrison and Boyce, 2008). Planning for landscape connectivity can also be used as an example for the field of planning itself. We are entering a time of rapid ecological change and, just as wildlife and plants

must adapt to the changing environment, so too must planners adapt. Planners must become adept at planning for change and uncertainty. Planners must become more aware of scientific theory, which itself will continue to undergo change. For example, as the effects of climate change begin to unfold, the planning profession will face intense challenges. The position of planner as neutral facilitator will no longer be sufficient or appropriate.

The research findings have also shown that planners should pay close attention to the potential impacts of public participation and media on their planning projects. As noted by Edey et al. (2006, pp 159-160),

> Ideally, planners should begin to see and use the media as a tool to inform the public and to advocate community planning goals and strategies. Thus, it is prudent to see media coverage and formal public participation in planning activities as part of an overall consultative process and to develop strategies and approaches that seek to reinforce and coordinate these two activities.

This was an important factor in the outcomes of the case studies in Chapter 7. This ties in with the actions of individuals, which are also significant in moving landscape connectivity theory into practice in Ontario. Planners should not underestimate the power of individuals, whether private citizens at the grassroots level or well-connected public officials, to influence the outcome of planning projects. Planners should remember to include the importance of their own actions, especially when, as is the case with landscape connectivity, scientific theory is not sufficiently advanced for precise decision-making and planners must rely on best professional judgement.

8.4 Contribution to Planning Theory

Through its examination of planning for landscape connectivity, this dissertation also examines the Government of Ontario's attempts to link conservation biology theory with land use and landscape planning. As noted by Nassauer (2006),

enormous benefits would accrue if conservation biology and landscape planning were to "actively inform and change each other" (p. 677). Lindenmayer et al. (2008) call for better translation of "findings from the enormous body of knowledge from conservation biology, landscape ecology and restoration ecology" into "on-the-ground management of landscapes"(p. 89). To this end, Lindenmayer et al. suggest increasing the number of scientifically-based landscape planning and management examples that encompass true active adaptive management examples. The case studies presented in this dissertation serve as such examples. For example, the ORM case study is noted for the "link between science and planning in the ORM Conservation Plan" which "represents an attempt to link ecology, concepts of land use and planning" (Hanna and Webber, 2005, p. 105).

Chapter 2 suggested that adaptive planning and management could potentially be an important approach for landscape connectivity. The findings of this research confirm that adaptive planning and management is a very important approach to planning for landscape connectivity projects. Chapter 2 also suggested that a landscape ecological planning approach would be useful for addressing landscape connectivity planning. The landscape ecological planning framework was applied to the case studies in Chapter 7 and the results indicate that it is, indeed, an appropriate and very useful framework for addressing landscape connectivity in Ontario.

8.5 Directions for Future Research

This research detected potential directions for future research. These include:

- Compare Ontario with other jurisdictions (e.g. other provinces or states). Are the circumstances that allowed for a movement from theory to practice in planning for landscape connectivity unique to Ontario?
- Explore the evolution of Ontario's environmental NGOs approaches to landscape connectivity.
- Apply the analytical framework presented in Chapter 3 to other case studies.
- Continue with Chapter 7's case studies, looking beyond planning process to monitoring and implementation.
- Explore the role of professional planners involved with landscape connectivity planning in Ontario. Do they feel adequately equipped to plan for landscape connectivity? Are there best practices?

8.6 Conclusions

The purpose of this dissertation was to examine how the theory of landscape connectivity has been applied in Ontario's land use planning policy and practice between 1970 and 2008. This included evaluating the degree to which theory has been applied to practice in landscape connectivity planning. In addition, the work investigated the circumstances that facilitated the movement from theory to practice in planning for landscape connectivity. The research design was qualitative. The research questions were answered using a literature review, content analysis and case study research. Chapter 2's literature review identified the principles of scale, uncertainty, and dynamic non-equilibrium as being of great importance to the study of landscape connectivity. Landscape connectivity is interdisciplinary, deals with spatial, biological and temporal analyses at multiple scales and must include human influences. An integrated, interdisciplinary and flexible planning approach is thus required. Chapter 4

demonstrated that there has been a movement from theory to practice in planning for landscape connectivity in Ontario between 1970 and 2008. The introduction of conservation biology principles, including but not limited to landscape connectivity, created a growing public awareness, which contributed to rising pressure on the Ontario government to reform its land use planning policies. The theory of landscape connectivity is included in key land use planning legislation and policies and is now an accepted part of planning for natural heritage in the province.

Chapter 5 presented a content analysis that examined how Ontario's land use planning law and policy directed planners to apply the concept of landscape connectivity between 1970 and 2008. The content analysis found the concept of landscape connectivity in over half of the land use planning documents examined. The content analysis demonstrated that Ontario's land use planning law and policy often does not provide explicit direction to planners. The concept of landscape connectivity itself was portrayed largely as a neutral or positive concept. Although planners in Ontario are increasingly expected to plan for landscape connectivity, the details of how exactly they should do so remain unclear.

Chapter 6 presented an analysis of the manner in which the landscape connectivity provisions of relevant legislation and policies were interpreted and applied by the Ontario Municipal Board (OMB). The analysis confirmed that provincial policies are, in general, being applied in favour of landscape connectivity on private land. In most of the cases in which landscape connectivity was identified as a deciding factor, the presiding Board Member ruled in favour of protecting landscape connectivity. Chapter 7 examined four landscape connectivity case studies from Ontario and compared them to a planning framework for landscape connectivity that was first presented in Chapter 3. The planning process for all was largely interdisciplinary and public. All three cases with an identified approach to linkage

design took an intuitive, rather than an empirical or modeling approach, and they all used a Natural Heritage System concept. Planning strategies were mainly defensive. Additionally, the role of science and political will were found to have a great impact on the outcome of the case studies.

However, the vast majority of the land within Ontario is managed by scientifically outdated plans and processes for Crown land. The Crown land planning process could be substantially improved if they adopted many of the processes found within municipal planning. These would include the use of a compulsory provincial policy statement on natural heritage planning, planning processes that allow for open discussion of principles and practices, widespread appeal processes, access to administrative tribunals for all stakeholders and much more clarity in planning directions and documents. These improvements would significantly benefit Ontario's approach to landscape connectivity specifically and natural heritage planning in general.

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060548 Glazer, Lotzmann and Gedja v. Region of Waterloo and City of Waterloo, September 17, 2007 (OMB Decision Number 2536).

Appendix A: Document Review for Chapter 5's Content Analysis

(Presented chronologically)

Title: ***Provincial Parks Act*** (Government of Ontario, 1913, 1954, RSO 1990)
Purpose: This Act established the provincial parks system as the premier vehicle for protecting areas on a province-wide basis.

Title: ***Public Lands Act*** (Government of Ontario, 1913, RSO 1990)
Purpose: This Act gives the Minister of Natural Resources authority over the management, sale and disposition of public lands and forests in Northern Ontario.

Title: ***Planning Act*** (Government of Ontario, 1944, RSO 1990)
Purpose: This Act sets the rules for land use in the province. The purposes are: a) to promote sustainable economic development in a healthy natural environment within the policy and by the means provided under this Act; (b) to provide for a land use planning system led by provincial policy; (c) to integrate matters of provincial interest in provincial and municipal planning decisions; (d) to provide for planning processes that are fair by making them open, accessible, timely and efficient; (e) to encourage co-operation and co-ordination among various interests; (f) to recognize the decision-making authority and accountability of municipal councils in planning.

Title: ***Conservation Authorities Act*** (Government of Ontario, 1946, RSO 1990)
Purpose: This Act marked a new approach to conservation in Ontario wherein a number of municipal councils agreed to share responsibility, on a watershed basis, for natural resource management with the Province. The objects of a Conservation Authority are to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals.

Title: ***Wilderness Areas Act*** (Government of Ontario, 1959, RSO 1990)
Purpose: This Act recognized the need for legislation to protect natural areas, and provided for preservation of areas in their natural state.

Title: ***Niagara Escarpment Protection Act*** (Government of Ontario, 1970)
Purpose: This Act restricted mineral resource extraction near the Escarpment.

Title: ***Endangered Species Act*** (Government of Ontario, 1971, RSO 1990)
Purpose: This Act addressed a growing concern for endangered species and their habitats in Ontario.

Title: ***Parkway Belt West Planning and Development Act*** (Government of Ontario, 1973, RSO 1990)
Purpose: This Act allowed for the implementation of the Parkway Belt West Plan.

Title: ***Niagara Escarpment Planning and Development Act*** (Government of Ontario, 1973, RSO 1990)
Purpose: The purpose of this Act is to provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment,

and to ensure only such development occurs as is compatible with that natural environment.

Title: ***Ontario Environmental Assessment Act*** (Government of Ontario, 1976, RSO 1990)
Purpose: The purpose of this Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment.

Title: ***Ontario Environmental Protection Act*** (Government of Ontario, 1976, RSO 1990)
Purpose: This Act provided for the protection and conservation of the natural environment in Ontario.

Title: **Parkway Belt West Plan** (1978)
Purpose: To provide a multipurpose utility corridor, urban separator and linked open space system.

Title: **Provincial Parks Policy Statement** (1978)
Purpose: This policy provides a basis for planning and management decisions affecting Ontario's Provincial Parks System, the goal of which is to provide a variety of outdoor recreation activities and to protect provincially significant natural, cultural and recreational environments in a system of Provincial Parks.

Title: **Ontario Provincial Parks: Planning and Management Policies** (OMNR, 1978, 1992)
Purpose: The "Blue Book", as it came to be known, consolidated parks policies and provided direction for park planners and managers.

Title: **Niagara Escarpment Plan** (1985, 1994, 2005)
Purpose: The purpose of this Plan is to provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment.

Title: ***Conservation Land Act*** (Government of Ontario, 1988, RSO 1990)
Purpose: This Act encouraged private landowners to protect natural values by providing property tax rebates.

Title: **Flood Plain Planning Policy** (OMNR, 1988)
Purpose: This policy provides direction for flood plain management in Ontario. The intent is that land use planning and the regulation of development provide a preventative and comprehensive approach.

Title: **Wetlands Policy** (OMNR, 1992)
Purpose: This policy provides direction for land use planning and management decisions affecting wetlands in Ontario.

Title: **Comprehensive Set of Policy Statements** (1994)
Purpose: The Comprehensive Set of Policy Statements included six policy areas that planning decisions were now required, under the *Planning Act*, to "be consistent with".

The policy areas were: Natural Heritage and Ecosystem Protection and Restoration Policies; Community Development and Infrastructure Policies; Housing Policies; Agricultural Land Policies; Conservation Policies; Non-renewable Resource Policies, and Implementation Polices.

Title: ***Crown Forest Sustainability Act*** (Government of Ontario, 1994)
Purpose: The purposes of this Act are to provide for the sustainability of Crown forests and to manage Crown forests to meet social, economic and environmental needs of present and future generations. It guides all forest management on Crown lands in Ontario.

Title: ***Ontario Planning and Development Act*** (Government of Ontario, 1994)
Purpose: This Act allows the Province to establish development planning areas and to create development plans relating to economic, social and physical development of the area.

Title: **Implementation Guidelines for the Comprehensive Set of Policy Statements** (1995)
Purpose: These guidelines provided over 700 pages of background information, interpretation of policies and suggestions for policy implementation (for the Comprehensive Set of Policy Statements).

Title: **Provincial Policy Statement** (1997)
Purpose: Issued under authority of the *Planning Act*, the PPS provides policy direction on matters of provincial interest related to land use planning and development.

Title: **Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan** (1997)
Purpose: The purpose of this plan is to preserve wilderness, landscapes and natural features for future generations. It is the OMNR's commitment to complete a system of parks and protected areas which will represent the full range of the province's natural and cultural features.

Title: **Resource-Based Tourism Policy** (1997)
Purpose: The purpose of this policy is to promote and encourage development of the Ontario resource-based tourism industry in an ecologically and economically sustainable manner.

Title: **Ontario Forest Accord** (1999)
Purpose: This Accord is the outcome of negotiations between the forest industry, the OMNR and the Partnership for Public Lands, a coalition of environmental organizations. Included is the commitment to protect 12% of the planning area as parks and protected areas.

Title: **Ontario Living Legacy Land Use Strategy** (1999)
Purpose: This strategy is the end product of the Lands for Life Planning Process and it sets a framework for future land and resource management on 39 million hectares of Crown lands and waters in a planning area covering 45 percent of the province.

Title: **Natural Heritage Reference Manual** (OMNR, 1999)
Purpose: A comprehensive guide for planners and others who require additional information on technical issues relative to the application of Section 2.3- Natural Heritage of the Provincial Policy Statement. It provides guidance on how to implement the natural heritage policies.

Title: **Significant Wildlife Habitat Technical Guide** (OMNR, 2000)
Purpose: A technical manual to assist planning authorities and other participants in the municipal planning system by providing detailed information on the identification, description and prioritization of significant wildlife habitat. This guide is advisory and is intended for use in the municipal policy and development process under the Planning Act.

Title: ***Oak Ridges Moraine Conservation Act*** (2001)
Purpose: This Act authorizes the Government of Ontario to provide for the protection of the Oak Ridges Moraine Area through the implementation of the Oak Ridges Moraine Conservation Plan.

Title: **Oak Ridges Moraine Conservation Plan** (2002)
Purpose: This is an ecologically based plan established by the Ontario government to provide land use and resource management direction for the 190,000 hectares of land and water within the Moraine.

Title: **Room to Grow Final Report** (2002)
Purpose: This is the Ontario Forest Accord Advisory Board's final report on implementation of the Ontario Forest Accord. It proposes the Room to Grow policy framework.

Title: **Room to Grow Policy** (2003)
Purpose: This policy framework ties the expansion of any new wood supply to an equivalent expansion of protected areas in the province.

Title: ***Crown Forest Sustainability Act*** (2004)
Significance: This Act guides all forest management on public lands in Ontario. It requires that the OMNR ensure that forests management sustains environmental, economic and social values.

Title: ***Strong Communities (Planning Amendment) Act*** (Government of Ontario, 2004)
Purpose: This Act is "the first step in planning reform", intended to put the public first and open up the planning process by allowing more time for public scrutiny, boosting environmental protection and better protecting the public interest (MMAH, 2007).

Title: ***Greenbelt Act*** (Government of Ontario, 2005)
Purpose: This Act enables the creation of a Greenbelt Plan to protect about 1.8 million acres of environmentally sensitive and agricultural land in the Golden Horseshoe from urban development and sprawl. It includes and builds on about 800,000 acres of land within the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan.

Title: **Provincial Policy Statement** (2005)
Purpose: Issued under authority of the *Planning Act*, the PPS provides policy direction on matters of provincial interest related to land use planning and development. The PPS provides for appropriate development while protecting resources of provincial interest, public health and safety and the quality of the natural environment.

Title: ***Places to Grow Act*** (Government of Ontario, 2005)
Purpose: This Act is intended to help the Ontario government plan for growth in a strategic and coordinated way that balances the needs of the economy with the environment.

Title: **Ontario Biodiversity Strategy** (2005)
Purpose: This strategy sets out a plan in which all Ontarians, communities and sectors of society can and must play an important role. Its vision is about sharing responsibility for conserving Ontario's biodiversity.

Title: **Greenbelt Plan** (2005)
Purpose: This plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring on this landscape. The Greenbelt Plan includes lands within, and builds upon the ecological protections provided by, the Niagara Escarpment Plan (NEP) and the Oak Ridges Moraine Conservation Plan (ORMCP). It also complements and supports other provincial level initiatives such as the Parkway Belt West Plan and the Rouge North Management Plan. (MMAH 2005).

Title: **Places to Grow: Growth Plan for the Greater Golden Horseshoe** (Ontario Ministry of Public Infrastructure Renewal, 2006)
Purpose: This plan, prepared under the *Places to Grow Act*, is a framework for implementing the Government of Ontario's vision of building stronger, prosperous communities by better managing growth in this region to 2031.

Title: ***Provincial Parks and Conservation Reserves Act*** (Government of Ontario, 2006)
Purpose: The purpose of this Act is to permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions, protects provincially significant elements of Ontario's natural and cultural heritage, maintains biodiversity and provides opportunities for compatible, ecologically sustainable recreation.

Title: ***Planning and Conservation Land Statute Law Amendment Act*** (Government of Ontario, 2006)
Purpose: This Act is intended to build upon previous reforms to Ontario's land use planning system (see Strong Communities Act 2004; PPS 2005; Greenbelt Act 2005; Places to Grow 2006) and make the OMB more effective and accessible to the public.

Title: ***Endangered Species Act*** (Government of Ontario, 2007)
Purpose: The purposes of this Act are: To identify species at risk based on the best available scientific information, including information obtained from community knowledge and aboriginal traditional knowledge; to protect species that are at risk and their habitats, and to promote the recovery of species that are at risk; and, to promote stewardship activities to assist in the protection and recovery of species that are at risk.

Appendix B: Coding and Recording Procedures

Identifying Landscape Connectivity Statements

First pass: All documents were read in their entirety, key words were highlighted and new words to original list of acceptable terms (see Table B1)

Concept	Acceptable terms/Key words
Landscape connectivity	Connectivity Ecological connectivity Habitat connectivity Landscape connectivity Landscape permeability NOT transportation systems NOT transportation corridors NOT infrastructure corridors Wildlife/animal/plant movement Corridor Conservation corridor Ecological corridor Habitat corridor Landscape corridor Migration corridor Natural corridor Wildlife corridor Linkage Ecological linkage Habitat linkage Landscape linkage Natural linkage Wildlife linkage Aquatic linkage Terrestrial linkage Connecting links Natural connections Greenway Continuous natural environment Continuous natural landform Continuity of open space Contiguous Metapopulation Fragmented Unfragmented Habitat fragmentation Landscape fragmentation

Second pass: All documents were read again. Data was broken down into statements, either full sentences or groups of sentences addressing the same issue. Each statement equals one item.
Statements were then transferred to an Excel spread sheet.
Third pass: The documents were read again and compared to the Excel spread sheet entries.

Assigning Statements to Categories

Questions to ask of each statement:

1. What type of statement is this?
2. How does this statement portray landscape connectivity?

Question 1: What type of statement is this?

There are four categories to which relevant statements can be assigned

1= Imperative
2= Positive
3= Advisory
4= Neutral

If the statement contains limitations and prohibitions, then the statement is recorded as **imperative**. For example, "Development is not permitted in significant wildlife corridors".

- If the statement contains positive words such as "shall" or "will", then the statement is recorded as **positive**. For example, "In Natural Linkage Areas and Countryside Areas, new aggregate resource operations shall have to meet stringent review and approval standards."
- If statement contains enabling or supportive language, such as "should", "promote" or "encourage", then the statement is recorded as **advisory**. For example, "Municipalities should consider planning, design and construction practices that maintain or where possible enhance the size, diversity and connectivity of key natural heritage features."
- If statement contains no words that convey direction, then the statement is recorded as **neutral**. For example, "Connectivity means the degree to which key natural heritage or key hydrologic features are connected to one another by links such as plant and animal movement corridors, hydrologic and nutrient cycling, genetic transfer, and energy flow through food webs."

Question 2: How does this statement portray landscape connectivity?

There are four categories to which statements can be assigned:
1= Positive concept
2= Neutral concept
-1= Negative concept
-2= Both positive and negative

- If the statement portrays landscape connectivity as a positive concept, then the statement is recorded as **positive**. For example, “Corridors provide important ecological functions”.
- If the statement portrays landscape connectivity as a neutral concept, then the statement is recorded as **neutral.** For example, “Utility right-of-ways may serve as potential animal movement corridors”.
- If statement portrays landscape connectivity as a negative concept, then the statement is recorded as **negative**. For example, “Corridors accelerate the spread of invasive species”.
- If statement portrays both positive and negative aspects of landscape connectivity, then the statement is recorded as **both positive and negative.** For example, “A corridor may be beneficial for some species but detrimental to others”.

Appendix C: Landscape Connectivity Content within Ontario's Land-use Planning Law and Policy

1970s

Niagara Escarpment Protection Act* and *Niagara Escarpment Planning and Development Act (1970, 1973, R.S.O.1990)

The purpose of this legislation is to "provide for the maintenance of the Niagara Escarpment and land in its vicinity as a continuous natural environment and to ensure only such development occurs as is compatible with that natural environment". Although the concept of landscape connectivity is found in the statement of purpose, this is the only statement in the Act which refers to landscape connectivity and, so, the legislation provides little in the way of direction or guidance for planners. Direction for planners is found in the Niagara Escarpment Plan, discussed below in the Provincial Plans section.

Parkway Belt West Plan, 1978

The Parkway Belt West Plan (PBWP) was implemented in 1978 for the purposes of providing a multipurpose utility corridor, urban separator and linked open space system (MMAH, 2002). The Ministry of Municipal Affairs and Housing described the PBWP as "a culmination of regional planning, greenbelt planning and greenway planning (MMAH, 2002). One of the four major goals of the PBWP was to provide a linked open space framework. The PBWP contained twelve landscape connectivity statements, including references to maintaining and enhancing the continuity of open-space character, protecting natural features, protecting valleys, woodlands, and hedgerows, minimizing the number of road crossings through valleys and ensuring free movement of wildlife through major valleys.

The PBWP advised planners to provide for the continuity of open space but, in practice, the goal of a linked open space system was not realized. The Parkway Belt is

instead an example of how landscape connectivity, when included as one of several goals in a "multipurpose" corridor such as a greenbelt, may be trumped by competing goals or purposes. The central focus of the PBWP was the coordination of large-scale infrastructure projects and, by 1996, the last remaining portions of undeveloped lands within the Parkway Belt became the site of Highway 407 and the parkway belt concept was abandoned (Wekerle et al, 2007). In the third reading of the (then) proposed *Greenbelt Protection Act* in 2004, NDP Member of Parliament Marilyn Churley read a quote from Dr. Rick Smith of Environmental Defense Canada in which he cautioned that the proposed greenbelt could become as "stillborn and unsuccessful an initiative as the ill-fated parkway belt -- a chunk of land that was supposed to be a greenbelt and regrettably is now known as the 407".

Ontario Provincial Parks: Planning and Management Policies, 1978

The 1978 document contains eight landscape connectivity statements. These statements were mainly descriptive and focus on waterway corridors. One statement described how Northern Wilderness Parks would, over time, "increasingly become "islands" or refuges of plant and animal communities sensitive to …development" (OMNR, 1978, p. Wi-II-1). Another statement mentioned, "In Southern Ontario, the original forest stands have almost entirely diminished to isolated woodlots" (OMNR, 1978, p. NR-1-8). Only one statement provided direction to planners. It stated that boundaries of Waterway Parks "shall not be less than 200m from the shoreline", as a "minimum standard to protect representative waterway corridors" (OMNR, 1978, p. Wa-III-3). The document raised the issue of landscape connectivity but did not provide much in the way of direction for planners. This is not surprising, however, as the concept of landscape connectivity was relatively new to Ontario at the time the document was written in 1978.

1980s

Niagara Escarpment Plan 1985

There are two landscape connectivity statements in the NEP 1985. Both of these referred to the Bruce Trail, which was described as "an essential component of the Niagara Escarpment Parks System linking parks and natural features" (Niagara Escarpment Commission, 1985, p. 32). There was no direction for planners on ecological linkages.

1990s

Planning Act (R.S.O. 1990)

The *Planning Act R.S.O 1990* contains two landscape connectivity statements, located in Section V Land Use Control and Administration, Chapter 34 Zoning By-Laws. It gives local municipalities the authority to pass by-laws concerning:

> Natural features and areas
> 3.2 For prohibiting any use of land and the erecting, locating or using of any class or classes of buildings or structures within any defined area or areas,
> i. that is a significant wildlife habitat, wetland, woodland, ravine, valley or area of natural and scientific interest,
> ii. that is a *significant corr*idor or shoreline of a lake, river or stream, or
> iii. that is a *significant natural corridor*, feature or area.

The *Planning Act*, as of 1990, thus directs planners to protect significant aquatic and natural corridors. This is significant, as the *Planning Act* sets the rules for the land-use planning system in Ontario. "Significant natural corridors" were included in the list of natural heritage features and areas to be protected in the Comprehensive Set of Policy Statements from 1994 and the Implementation Guidelines for the Comprehensive Set of Policy Statements included a detailed section, which explained how to evaluate

significant natural corridors and the planning implications of the significant natural corridor policy. However, later provincial policy statements, namely the PPS 1997 and the PPS 2005, did not include any information on "significant natural corridors", nor did their supporting documents, the Natural Heritage Reference Manual and the Significant Wildlife Habitat Technical Guide. In addition to the lack of guidelines and weak accompanying support of the PPS, the provincial government failed to specify that an absence of possible negative impacts must be demonstrated before development or site alteration is permitted in significant natural corridors (McWilliam, 2007).

Wetlands Policy (1992)

There are three landscape connectivity statements in the Wetlands Policy from 1992. The first, located in the Background section, stated, "If individual wetland areas share wetland functions and are interconnected ecologically, they may be considered as one wetland complex and evaluated accordingly" (OMNR, 1992, p.6). The second, located in the Definitions section, defined Adjacent Lands as, " b) all lands connecting individual wetland areas within a wetland complex" (OMNR, 1992, p. 8). The third statement referred to wetlands in the Great Lakes St. Lawrence Region, and states that development may be permitted on adjacent lands only if it does not result in "loss of contiguous wetland area" (OMNR, 1992, p.10).

Ontario Provincial Parks: Planning and Management Policies, 1992

The updated 1992 document contains six landscape connectivity statements. As with the 1978 document, there is one statement describing Wilderness Parks as islands (now located in an Appendix). A new statement discusses the permanence of Ontario's Provincial Park System and cautions, again, "These areas could conceivably become islands in a landscape that has been altered by development or extraction" (OMNR, 1992, p. 12). There is another new statement describing the state of Ontario's natural

areas, "In southern Ontario (average 77% private, 23% Crown), agriculture, urban and industrial development, aggregate extraction, timber harvesting and other activities increasingly fragment the landscape" (OMNR, 1992, p. 9). The remaining statements describe waterway corridors. Again, there is one statement which directs planners to impose a minimum 200 metre boundary for Waterways Parks but this updated version states, "…boundaries must be at least 200 metres from the shoreline (normally the high water mark), and should take into account lines of sight, proximity of landforms, and ecological integrity. The 200 metres should be treated as a minimum standard – wider corridors where appropriate, or large nodes to protect concentrations of significant features are both real considerations" (OMNR, 1992, p. 35).

Comprehensive Set of Policy Statements, 1994

There are nine landscape connectivity statements in the Comprehensive Set of Policy Statements from 1994. As discussed in Chapter Four, the Comprehensive Set of Policy Statements provided clear direction to planners with regard to landscape connectivity. Corridors were included in the list of natural heritage features and areas to be protected,

> A 1.2 Natural heritage features and areas will be protected.
> a) *Development will not be permitted in significant ravine, valley, river and stream corridors*, and in significant portions of the habitat of endangered species and threatened species.
>
> Development will not be permitted on adjacent lands if it negatively impacts the natural features or the ecological functions for which the area is identified.
>
> b) Except for the areas covered in a), significant portions of the habitat of vulnerable species, *significant natural corridors*, significant woodlands south and east of the Canadian Shield, areas of scientific and natural interest, shorelines of lakes, rivers and streams, and significant wildlife habitat will be classified into areas where either:
> 1) no development is permitted; or
> 2) development may be permitted only if it does not negatively impact the natural features or the ecological functions for which the area is identified.
>
> Development will not be permitted on adjacent lands to 1) and 2) if it

> negatively impact the natural features or the ecological functions for which the area is identified.

These statements prohibit development in significant ravine, valley, river and stream corridors. Development in significant natural corridors is prohibited or permitted only if it does not negatively impact the corridor or its ecological functions. In addition,

> A.1.4. In decisions regarding development, every reasonable opportunity should be taken to: maintain the quality of air, land, water and biota; maintain biodiversity compatible with indigenous natural systems; and *protect natural links and corridors*. The improvement and enhancement of these features and systems is encouraged (MMAH 1994, p. 1).

Thus the protection and enhancement of natural links and corridors, or non-significant corridors, is encouraged.

Corridors were also listed as a trigger for an environmental impact study for development proposals on adjacent lands,

> 6.1 Except in the circumstances identified in 6.3 below, an environmental impact study (EIS) will be required for development proposals in the following areas:
> • Lands adjacent to *significant ravine, valley, river and stream corridors*, to significant portions of the habitat of endangered species and threatened species and to the features covered by policy A1.2b)1); and
> • Lands in and adjacent to significant portions of the habitat of vulnerable species, *significant natural corridors*, significant woodlands south and east of the Canadian Shield, areas of scientific and natural interest, shorelines of lakes, rivers and streams, and significant wildlife habitat, in accordance with policy A1.2b)2) (MMAH 1994, p. 19).

These statements and the statements from A1.2 clearly identify the importance of lands adjacent to corridors and require development proposals to prove that the corridors and their ecological functions will not be negatively impacted.

The other landscape connectivity statements in the Comprehensive Set of Policy Statements were descriptive, including detailed descriptions of corridors (see Chapter 4), natural heritage features and areas and adjacent lands.

Implementation Guidelines for the Comprehensive Set of Policy Statements, 1995

There are 101 landscape connectivity statements in the Implementation Guidelines for the Comprehensive Set of Policy Statements. The Implementation Guidelines included a detailed section (see 2.2.7, p. 31) on significant natural corridors, which explained:

- The ecological benefits of corridors
- The importance of planning for corridors in Ontario
- How to evaluate corridors
- The planning implications of the significant natural corridor policy
- Where to find further information on corridors

As discussed in Chapter Four, the Implementation Guidelines provided municipal planners with clear direction and detailed information on planning for connectivity.

Niagara Escarpment Plan 1994

There are 28 landscape connectivity statements in the NEP 1994. The purpose of the Plan was "to provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as a *continuous natural environment*, and to ensure only such development occurs as is compatible with that natural environment" (Niagara Escarpment Commission, 1994, p.3). Almost all of the landscape connectivity statements referred to the Bruce Trail, which is described as,

3.2 The Bruce Trail

> The Bruce Trail is an essential component of the Niagara Escarpment Parks and Open Space System *linking parks, open space areas and natural features through the establishment of a Trail corridor* in conjunction with Bruce Trail Access Points and Overnight Rest Areas. The long-term goal is to secure a *permanent corridor for the Bruce Trail along its entire length* (Niagara Escarpment Commission 1994, p. 75)

One statement in the NEP directed planners to maintain wildlife corridors,

> 2.8 Wildlife Habitat
> The objective is to protect the habitat of rare, vulnerable, threatened, and endangered plant and animal species, and minimize the impact of new development on wildlife habitat.
> 1. New development will not be permitted in identified habitat of endangered plant or animal species.
> 2. *Development shall be designed so as to*:
> a) minimize the impacts upon wildlife habitat, in particular, rare, vulnerable, threatened plant or animal species, as identified by onsite evaluation;
> b) *maintain wildlife corridors and linkages with adjacent area*s; and
> c) enhance wildlife habitat wherever possible. ((Niagara Escarpment Commission 1994, p.52).

This is the only statement in the revised NEP that directs planners to maintain connectivity. Note that this statement does not prohibit development in wildlife habitat or linkages, but requires that development shall be designed so as to maintain connectivity.

Provincial Policy Statement 1996, revised 1997

The PPS 1996 (revised 1997) contains only one landscape connectivity statement:

> 2.3.3 The diversity of natural features in an area, and the *natural connections between them* should be maintained, and improved where possible.

This document provided planners with considerably less direction than the Comprehensive Set of Policy Statements that it replaced. Corridors were removed from the list of natural heritage features and areas to be protected and did not merit even a definition. The term “natural connections” was not defined or explained. Also,

planners were required to “have regard to” the policies in the PPS, which is a weaker test than the “shall be consistent with” phrasing of the Comprehensive Set of Policy Statements and thus a lower policy implementation standard. These 1996 and 1997 PPS documents were prepared under the right wing Harris Government that was pro-development and therefore weakened environmental policy in order to allow development to go forward faster and easier.

Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan, 1997

Nature's Best Ontario's Parks and Protected Areas: The Framework and Action Plan contains 23 landscape connectivity statements. The goal of the plan is “To establish a system of protected natural heritage areas, representing the full spectrum of the province’s natural features and ecosystems” (OMNR, 1997, p. 3). Thus the plan has the potential to affect the entire province. One of the objectives is to protect the proposed system of natural heritage areas through legislation, regulation, policies and programs. Section 2.3 states,

> Also, *linking natural heritage areas to supportive biological processes is needed to conserve biodiversity.* Without these linkages and resource management which supports ecological sustainability on the intervening landscape, larger protected areas would be needed to sustain natural heritage values. In certain settled or disturbed landscapes some significant areas remain isolated with few natural linkages to help sustain natural heritage values. Additional protected areas, *corridors, and linkages may have to be restored to ensure long term conservation of biodiversity and to ensure protected areas can be sustained* (OMNR, 1997, p.8).

Thus, Nature’s Best recognizes linkages as necessary for conserving biodiversity. The protection and restoration of linkages is an important criterion for designing natural heritage systems.

Interestingly, Nature's Best is the only plan examined for this content analysis which formally acknowledges the need for improved information related to landscape connectivity. As part of determining information and research priorities related to science principles and natural heritage areas, the plan states the need to,

> (i) Support research studies (including review of literature and existing knowledge) to improve information and knowledge on science principles related to natural corridors, linkages between natural heritage areas and ecosystem management (OMNR, 1997, p.33).

Overall, however, the plan provides little in the way of concrete direction for planners.

Ontario Living Legacy Land Use Strategy, 1999

The Ontario Living Legacy Land Use Strategy contains 59 landscape connectivity statements. All but two of the statements occur in Appendix A: Summary of Land Use Areas and Area-specific Policies. Almost all of these statements are descriptive and very few contain direction for planners. For example, most of the statements are similar to the following,

> ID:E2229w. Area Description: This *important caribou travel corridor links* Lake Nipigon and Onaman Lake along the southern boundary on the Onaman River, and has significance related to its location near the southern limit of caribou range. Extensive forest operations and associated access occurs in this corridor, as well as recreational angling and hunting (OMNR, 1999, p. 133).

This statement merely describes the existing state of the corridor. Only a few statements contain any direction for planners, such as,

> ID:E2251w. Land Use Intent: Forestry activities will be planned to protect caribou habitat and enhance travel routes from Lake Nipigon to Wabakimi Park in Ogoki Lake area. *Management activities and prescriptions will consider landscape and ecological linkages, and in particular the need to maintain a linked network of nature forest tracts* between Lake Nipigon and Wabakimi Park (OMNR, 1999, p.134).

This statement directs planners to enhance caribou travel routes and consider landscape and ecological linkages. There are only a handful of such directive statements regarding landscape connectivity in the strategy.

The OLL Strategy resulted in the protection of a corridor between Wabakimi Provincial Park and Lake Superior and the creation of 36 new waterways parks that serve as "river corridor linkages" between core protected areas (National Round Table on the Environment and the Economy, 2003). However, there is little direction found in the actual document with regard to planning for landscape connectivity. Indeed, connectivity between protected areas was later raised as an outstanding issue on which more work must be done (National Round Table on the Environment and the Economy, 2003). The OLL Strategy will be discussed further in Chapter 7.

Natural Heritage Reference Manual, 1999

The Natural Heritage Reference Manual (NHRM), a guidance document to the Provincial Policy Statement under the *Planning Act*, contains 130 landscape connectivity statements. Section 3 of the NHRM outlines an approach that planning authorities "may choose" in developing natural heritage systems,

> Development of a natural heritage system is offered as a comprehensive approach to defining natural heritage features and areas cited in Section 2.3.1 of the PPS, and to addressing Section 2.3.3 of the PPS which recognizes that the diversity of natural features in an area, and *the natural connections between them should be maintained, and improved where possible* (OMNR 1999, p. 3).

The NHRM intends for the natural heritage system approach to "encourage(s) planning authorities to go beyond the protection of specific natural heritage features and areas to consider the overall diversity and interconnectivity of natural features or areas" (OMNR 1999, p. 35). It is

important to note, however, that this natural heritage system approach is voluntary and therefore, so too, is its landscape connectivity content.

The NHRM refers to *The Natural Heritage of Southern Ontario's Settled Landscapes* (Riley and Mohr 1994) for a more complete description of the natural heritage system approach. It then states, "An ecological specialist can assist a planning authority in developing a natural heritage system that meets its particular circumstances" (OMNR 1999, p. 40). This very simple but important statement acknowledges the complexity of planning for natural heritage systems and the need for specialized assistance. General planners, even with the detailed guidance provided by the NHRM and SWHTG, are not qualified to plan for landscape connectivity.

The NHRM provides a good definition for linkages,

> Ecological Linkages: A linkage is a pathway, connection or relationship between natural heritage features and areas. The natural connections between them should be maintained, and improved where possible (PPS, Section 2.3.3). The importance of linkages in maintaining ecological functions is an important consideration in assessing potential development-related impacts (OMNR 1999, p.49).

Although elements of landscape connectivity are referred to throughout the NHRM, the language used tends to be weak. For example, a description of wildlife movement corridors states that they "can provide critical links between shelter, feeding, watering, growing and nesting locations" and continues,

> Wildlife movement corridors *can be valuable* at different spatial scales. For example, corridors that *might be important* at local (i.e., municipal) or regional (e.g., watershed, site district, site region) scales are those that: allow large mammals, such as deer, to move from their summer range to wintering areas; and allow wildlife to move freely between different parts of their habitat on a daily, seasonal or annual basis (e.g., from winter hibernation habitat to summer range) (OMNR 1999, p.29)

The use of the words "can" and "might" lessens the implied importance of corridors and their functions. Despite the weak wording, the NHRM does contain useful direction for planners. For example,

> Many types of habitat can provide wildlife movement corridors. These can include wetlands, wooded areas connecting forest patches, as well as meadows and old fields connecting more open habitats. Understanding the corridor habitat requirements of a species is important when planning for its protection. Streams, river valleys and lake shorelines provide some of the best corridors and, in some planning areas, these are the only significant animal movement corridors that remain.
>
> The identification of wildlife movement corridors is most effectively undertaken after the other significant wildlife habitats (e.g., concentration areas) and other natural heritage features and areas have been identified and mapped. A comprehensive approach could be particularly valuable in the identification process because: 1) existing linkages can be readily identified and evaluated; and 2) areas in which linkages are needed can be identified. At finer scales, planning authorities can capitalize on opportunities that may exist within their municipalities when identifying existing and/or potential wildlife movement corridors. Abandoned railway lines and unopened road allowances, although not necessarily ideal, may be a convenient way of setting some land aside for animal movement (OMNR 1999, p.29).

These statements provide useful information for identifying potential corridors.

Included in Section 2.7 Significant Wildlife Habitat is "A Recommended Approach for the Evaluation of Wildlife Movement Corridors (Significant Wildlife Habitat)", which provides a key contact (OMNR), factors and suggested standards. Again, though the content is useful, the wording is vague, "Attachment A.11 suggests examples of factors that could be used to evaluate the significance of wildlife movement corridors" (OMNR 1999, p. 29).

Along with ecological factors, the NHRM also considers other factors important to planning for landscape connectivity, such as public input, land tenure and "the feasibility of connecting, maintaining or improving natural heritage features and areas within the context of social and economic considerations" (OMNR 1999, p.39). It recommends that, "the municipality

should work with private landowners to ensure that connecting links on private land are consistent with their needs and objectives" (OMNR 1999, p.39).

Overall, the NHRM does provide useful general direction for planning for landscape connectivity but its effectiveness is weakened by its discretionary status.

2000-2008

Significant Wildlife Habitat Technical Guide, 2000

The Significant Wildlife Habitat Technical Guide (SWHTG), a guidance document to the Provincial Policy Statement under the *Planning Act,* contains 306 landscape connectivity statements. The SWHTG is a more detailed technical manual than the NHRM and it is "intended for use by ecologists, biologists, environmental planners and others involved in the development of strategies to identify and protect significant wildlife in the municipal planning process" (OMNR, 2000, p.2). Like the NHRM, the SWHTG is advisory only.

The landscape connectivity focus of the SWHTG is animal movement corridors, defined as,

> Animal movement corridors are elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. They exist at different scales and frequently link or border natural areas. Animal movement corridors encompass a wide variety of landscape features including riparian zones and shorelines, wetland buffers, stream and river valleys, woodlands, and anthropogenic features such as hydro and pipeline corridors, abandoned road and rail allowances, and fencerows and windbreaks. The Natural Heritage Component of the Provincial Policy Statement states that natural connections between natural features should be maintained and improved where possible (OMNR, 2000, p. 57).

There are too many landscape connectivity statements in the SWHTG and its voluminous appendices to summarize here, but suffice it to say that the SWHTG provides detailed direction to planners on the identification of significant wildlife

movement corridors, However, like the NHRM, the use of the SWHTG is discretionary.

Oak Ridges Moraine Conservation Act, 2001

There are three landscape connectivity statements in the *Oak Ridges Moraine Conservation Act*. The first statement occurs in the Interpretation section of the Act and refers to “natural linkage areas”. The second statement occurs in the Review section and states that a review under the Greenbelt Plan “shall not consider removing land from the natural core areas or the natural linkage areas” (Government of Ontario, 2001, c.31, s.3 (4)). This statement provides clear direction to planners to protect existing ORM linkages from future requests to remove land under the Greenbelt Plan. The third statement occurs in the Objectives section of the Act and states that one of the objectives of the Oak Ridges Moraine Plan is, “ensuring that the Oak Ridges Moraine Area is maintained as a continuous natural landform and environment for the benefit of present and future generations (Government of Ontario, 2001, c. 31, s. 4.). This statement supports the concept of landscape connectivity. Direction for planners is found in the Oak Ridges Moraine Conservation Plan, discussed below.

Oak Ridges Moraine Conservation Plan, 2002

The Oak Ridges Moraine Conservation Plan (ORCMP) contains 38 landscape connectivity statements. According to the ORMCP, the Ontario government's vision for the Oak Ridges Moraine is that of "a continuous band of green rolling hills that provides form and structure to south-central Ontario, while protecting the ecological and hydrological features and functions that support the health and well-being of the region's residents and ecosystems" (MMAH, 2002, p.-1). The ORMCP defines connectivity as “the degree to which key natural features are connected to one another

by links such as plant and animal movement corridors, hydrological and nutrient cycling, genetic transfer, and energy flows through food webs (MMAH, 2002, p. 5).

The ORMCP divides the Oak Ridges Moraine into four land use designations: Natural Core Areas (38%), Natural Linkage Areas (24%), Countryside (30%) and Settlement Areas (8%). Natural Linkage Areas are "areas forming part of a central corridor system that support or have the potential to support movement of plants and animals among the Natural Core Areas, Natural Linkage Areas, river valleys and stream corridors" (MMAH, 2002, p. 18). The purpose of Natural Linkage Areas is,

> to maintain, and where possible improve or restore, the ecological integrity of the Plan Area, *and to maintain, and where possible improve or restore, regional-scale open space linkages between Natural Core Areas and along river valleys and stream corridors*, by,
> (a) maintaining, and where possible improving or restoring, the health, diversity, size, and *connectivity* of key heritage features, hydrologically sensitive features and the related ecological functions;
> (b) maintaining, and where possible improving or restoring natural self sustaining vegetation over large parts of the area to *facilitate movement of plants and animals*;
> (c) *maintaining a natural continuous east-west connection and additional connections to river valleys and streams north and south of the Plan Area*;
> (d) maintaining the quantity and quality of groundwater and surface water;
> (e) maintaining groundwater recharge;
> (f) maintaining natural stream form and flow characteristics; and
> (g) protecting landform features.

Thus the ORMCP directs planners to maintain and, where possible, improve and restore regional-scale linkages and natural vegetation that facilitates animal and plant movement. The ORMCP also directs planners to maintain both the east-west connection and connections to valleys and streams north and south of the ORM plan area.

Section 20 of the ORMCP supports connectivity within Natural Linkage Areas and Natural Core Areas,

> Every application for development or site alteration shall identify planning, design and construction practices that ensure that *no buildings or other site alterations impede the movement of plants and animals* among key natural heritage features, hydrologically sensitive features and adjacent land within Natural Core Areas and Natural Linkage Areas (MMAH, 2002, p.29)

Development applications are thus required to include plans for maintaining connectivity within Natural Core Areas and Natural Linkage Areas. Likewise, Section 23(1) requires that a Natural Heritage Evaluation be prepared for any application that proposes development within 120 meters of key natural heritage features, which shall,

> (b) identify planning, design and construction practices that will maintain and, where possible, improve or restore the health, diversity and size of the key natural heritage feature and its *connectivity with other key natural heritage features;*
> (c) in the case of an application relating to land in a Natural Core Area, Natural Linkage Area or Countryside Area, *demonstrate how connectivity within and between key natural heritage features will be maintained and, where possible, improved or restored before, during and after construction*;

These statements provide clear direction to planners, in that they require that development applications demonstrate how connectivity will be maintained and, where possible, improved or restored, before, during and after construction. However, the ORMCP also permits a wide variety of land uses in Natural Linkage Areas, including,

> 1. Fish, wildlife and forest management.
> 2. Conservation projects and flood and erosion control projects.
> 3. Agricultural uses.
> 4. Transportation, infrastructure, and utilities as described in section 41, but only if the need for the project has been demonstrated and there is no reasonable alternative.
> 5. Home businesses.
> 6. Home industries.
> 7. Bed and breakfast establishments.
> 8. Farm vacation homes.
> 9. Low-intensity recreational uses as described in section 37.
> 10. Unserviced parks.
> 11. Mineral aggregate operations.
> 12. Wayside pits.
> 13. Uses accessory to the uses set out in paragraphs 1 to 12 (MMAH, 2002, p. 21).

Many of these uses are not compatible with maintaining landscape connectivity in the Natural Linkage Areas, specifically, or on the Oak Ridges Moraine in general. Uses 4 (Transportation, infrastructure and utilities), 11 (Mineral aggregate operations) and 12 (Wayside pits) are particularly problematic. As noted by the Environmental Commissioner of Ontario, allowing transportation and utilities, for example, throughout the entire Plan area seems contrary to its objectives (Environmental Commissioner of Ontario, 2005).

The ORMCP states that in Natural Linkage Areas and Countryside Areas, new aggregate resource operations and new transportation and utility corridors or facilities "shall have to meet stringent review and approval standards" (MMAH, 2002, p.-6). These standards do include requirements for maintaining landscape connectivity. For example, Section 35(2) states that an application for a mineral aggregate operation or wayside pit with respect to land in a Natural Linkage Area shall not be approved unless the applicant demonstrates,

> (3) In order to *maintain connectivity*, when a mineral aggregate operation or a wayside pit is located in a Natural Linkage Area, *there shall be at all times an excluded area* (which, for greater certainty, may contain both undisturbed land and land whose rehabilitation is complete) that,
> a) *is at least 1.25 km wide,*
> *b) lies outside the active or unrehabilitated portion*s of the area being used; and,
> c*) connects parts of the Natural Linkage Area outside the mineral aggregate operation or wayside pit* (MMAH, 2002, p.47).

This statement requires applications for mineral aggregate operations or wayside pits to demonstrate that connectivity will be maintained, and it demonstrates how the concept of landscape connectivity has changed in Ontario's law and policy since the 1970s. The Niagara Escarpment Plan (NEP), for example, through which 1973's *Niagara Escarpment Planning and Development Act* is implemented, allows aggregate extraction without any requirement for maintaining landscape connectivity.

The NEP was first released in 1985, revised in 1994 and again in 2005, and though its landscape connectivity elements increased with each successive revision, it still does not contain the same emphasis on maintaining connectivity as more recent plans like the ORM and Greenbelt Plan.

However, allowing new mineral resource operations within Natural Linkage Areas or Natural Core Areas at all is questionable, especially given the Oak Ridges Moraine's ecological and hydrological importance. The PPS supports mineral aggregate extraction, as it does not even require the applicant to demonstrate need for said aggregate resource. Thus the ORMCP, with support of the PPS, directs planners to maintain connectivity while also directing them to allow an incompatible and, some might argue unnecessary, land use in ecologically and hydrologically valuable lands.

Section 41(2) states that an application for a transportation, infrastructure or utilities use with respect to land in a Natural Linkage Area shall not be approved unless,

> a) the need for the project has been demonstrated and there is no *reasonable alternative*; and
> (b) the applicant demonstrates that the following requirements will be satisfied, *to the extent that is possible* while also meeting all applicable safety standards:
> 1. The area of construction disturbance will be kept to a minimum.
> 2. Right of way widths will be kept to the minimum that is consistent with meeting other objectives such as stormwater management and with locating as many transportation, infrastructure, and utility uses within a single corridor as possible.
> 3. The project *will allow for wildlife movement*.
> 4. Lighting will be focused downwards and away from Natural Core Areas.
> 5. The planning, design and construction practices adopted will keep any adverse effects on the ecological integrity of the Plan Area to a minimum (MMAH, 2002, p.53).

The requirement of demonstrated need is an improvement over the mineral aggregate policy, but the addition of "no reasonable alternative" and "to the extent that is

possible" also significantly weakens this policy as reasonable and possible are not defined.

Landscape connectivity is referred to throughout the ORMCP. It is a planning consideration not just in the Natural Core Areas and Natural Linkage Areas, but also in the Protected Countryside Areas and Settlement Areas. For example, both Protected Countryside Areas and Settlement Areas have as one of their objectives,

> *maintaining, and where possible improving or restoring*, the health, diversity, size, and *connectivity* of key natural heritage features, hydrologically sensitive features and the related ecological functions (MMAH, 2002, p.22).

Section 15(2) states that new lots in Countryside Areas "may encroach into a Settlement Area, but not into a Natural Core Area or Natural Linkage Area" (MMAH, 2002, p.22). Section 16(1) states that plans of subdivision with respect to land in Countryside Areas shall,

> (a) provide for *large, continuous open space blocks linking key natural heritage features and hydrologically sensitive features, to ensure connectivity;* and
> (b) design lots and roads so as to minimize stream crossings and extensions into key natural heritage features (MMAH, 2002, p. 22)

Clearly, there is significant landscape connectivity content in the ORMCP and it does provide good direction for planners. However, it may be difficult for planners to maintain landscape connectivity in the face of competing land use interests, such as aggregate extraction and transportation projects. Another difficulty is the fact that the responsibility for implementing the ORMCP lies with municipalities, and not the province. There is a valid concern that lower-tier municipalities may lack the resources and expertise needed to conduct the studies and reviews as required by the ORMCP (Environmental Commissioner of Ontario, 2002). This is especially true in the case of

landscape connectivity, as planning for this complex concept necessitates specialized assistance. The ORCMP will be discussed further in Chapter 7.

Greenbelt Act, 2005

There are three landscape connectivity statements in the *Greenbelt Act*. The *Greenbelt Act* states that three of the eleven objectives of the Greenbelt Plan are:

> a) to establish a network of countryside and open space areas which supports the Oak Ridges Moraine and the Niagara Escarpment;
> f) to promote connections between lakes and the Oak Ridges Moraine and Niagara Escarpment; and,
> h) to promote linkages between ecosystems and provincial parks or public lands (Government of Ontario, 2005, c.1, s.5)

These statements direct planners to establish and promote linkages. However, the other objectives of the Greenbelt Plan may conflict with this direction. This will be discussed below.

Greenbelt Plan, 2005

Ontario's Greenbelt Plan is the largest greenbelt in the world (Carter-Whitney, 2008). The Greenbelt Plan area consists of 728,000 hectares and "brings together the existing plans for the Niagara Escarpment and the Oak Ridges Moraine as "anchors" and an additional 400,000 hectares of new Protected Countryside in the Golden Horseshoe, in order to rein in urban sprawl and save farmlands and natural areas" (ON, 2006, p.6). The Greenbelt Plan contains 65 landscape connectivity statements. The Greenbelt Plan defines connectivity as "the degree to which key natural heritage or key hydrologic features are connected to one another by links such as plant and animal movement corridors, hydrologic and nutrient cycling, genetic transfer, and energy flow through food webs (MMAH, 2005c, p.48). The Plan includes connectivity in its goals:

> 2. Environmental Protection.
> b) *Protection and restoration of natural and open space connections* between the Oak Ridges Moraine, the Niagara Escarpment, Lake Ontario, Lake Simcoe and the major river valley lands, while also

> *maintaining connections to the broader natural systems of southern Ontario* beyond the Golden Horseshoe such as the Great Lakes Coast, the Carolinian Zone, the Lake Erie Basin, the Kawartha Highlands and the Algonquin to Adirondacks Corridor (MMAH 2005c, p. 5).

Thus the Greenbelt Plan recognizes the importance of maintaining connectivity at a regional scale, both within and beyond the Golden Horseshoe.

There is significant landscape connectivity content throughout the Greenbelt Plan. Connectivity is featured in the Natural Heritage System Policies, General Non-Agricultural Use Policies, Recreational Policies, Shoreline Area Policies, General Infrastructure Policies, and Non-Renewable Resources Policies. Some examples are provided below,

> 3.2.2 Natural Heritage System Policies.
> 3. New development or site alteration in the Natural Heritage System (as permitted by the policies of this Plan) shall demonstrate that:
> b) *Connectivity between key natural heritage features and key hydrologic features is maintained, or where possible, enhanced for the movement of native plants and animals across the landscape.*
>
> 4. Where non-agricultural uses are contemplated within the Natural Heritage System, applicants shall demonstrate that:
> b) *Connectivity along the system and between key natural heritage features or key hydrologic features located within 240 metres of each other is maintained or enhanced.*
>
> 5. The Natural Heritage System, including the natural features policies of section 3.2.4, does not apply within the existing boundaries of settlement areas, but does apply when considering expansions to settlements as permitted by the policies of this Plan. *Municipalities should consider the Natural Heritage Systems connections within settlement areas when implementing municipal policies, plans and strategies* (MMAH, 2005c, p. 17)

These policies emphasize the importance of maintaining connectivity between natural heritage features. Direction ranges from positive (connectivity shall be maintained or enhanced) to advisory (connections should "be considered").

Section 4.1.1 General Non-Agricultural Use Policies states that proposals for non-agricultural uses must demonstrate that "There are no negative impacts on the biodiversity or connectivity of the Natural Heritage System*"* (MMAH, 2005c, p. 28).

Section 4.1.2 Recreational Use Policies states that an application to establish or expand a major recreational use in the Natural Heritage System will be accompanied by a vegetation enhancement plan that incorporates planning, design, landscaping, and construction measures that will "Maintain or, where possible, enhance the amount of natural self-sustaining vegetation on the site and the connectivity between adjacent key natural heritage features or key hydrologic features (MMAH, 2005c, p.28).

Section 4.1.3. Shoreline Area Policies recognizes that "the shoreline areas of lakes (including the littoral zones) are particularly important and sensitive given the key natural heritage features and functions and because of the connectivity that shorelines provide for flora and fauna" (MMAH, 2005c, p. 28). Along with the application of the Natural Heritage System Policies of Section 3.2, these policies require that proposals for land use conversions, redevelopments and/or resort development shall:

> v. Integrate landscaping and habitat restoration into the design of the proposal to enhance the ability of native plants and animals to use the shoreline as both wildlife habitat and a *movement corridor* (MMAH, 2005c, p. 29).

Thus connectivity is recognized as a planning concern in Shoreline Area, Recreational and Non-Agricultural land use policies.

The Greenbelt Plan also considers connectivity beyond its boundaries. Section 3.2.5 External Connections states,

> The Natural Heritage System is connected to local, regional and provincial scale natural heritage, water resource and agricultural systems beyond the boundaries of the Greenbelt. To support the connections between the Greenbelt's Natural System and the local, regional and broader scale natural heritage systems of southern

> Ontario, such as the Lake Ontario shoreline, including its remaining coastal wetlands, the Great Lakes Coast, Lake Simcoe, the Kawartha Highlands, the Carolinian Zone and the Algonquin to Adirondack Corridor, the federal government, municipalities, conservation authorities, other agencies and stakeholders should:
> 4. Consider how activities and land use change both within and abutting the Greenbelt relate to the areas of external connections identified in this Plan;
> 5. Promote and undertake appropriate planning and design to ensure that external connections are maintained and/or enhanced; and
> 6. Undertake watershed based planning, which integrates supporting ecological systems with those systems contained in this Plan (MMAH, 2005c, p.20).

This statement confirms that the Greenbelt Plan recognizes that the Natural Heritage System is connected to other systems at a local, regional and provincial scale and so, accordingly, the Plan promotes planning that maintains and enhances those external connections.

The Greenbelt Plan does not identify linkages as a natural heritage feature but it clearly does consider landscape connectivity to be an important component of the Greenbelt. However, the success of the Greenbelt Plan at maintaining connectivity may be limited. Greenbelts are a planning strategy in which development controls are placed on wide swaths of public and private land in order to control urban growth and protect natural features near cities; however, analyses have shown that they often fail to either control urban growth or protect natural features (Erickson, 2004, add more). In the case of Ontario's Greenbelt Plan, its many objectives may trump landscape connectivity. A recent comparison of greenbelts around the world concluded that Ontario's Greenbelt Plan has the best legal protection (Carter-Whitney, 2008). However, as is the case with the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan, the Greenbelt Plan allows traffic and utility projects and aggregate extraction throughout the Plan area (Environmental Commissioner of Ontario, 2005). These exemptions pose

a serious threat to landscape connectivity. Section 4.2.1 General Infrastructure policies states that,

> Where infrastructure does cross the Natural Heritage System or intrude into or result in the loss of a key natural heritage feature or key hydrologic feature, including related land- form features, planning, design and construction practices shall minimize negative impacts and disturbance on the features or their related functions, *and where reasonable, maintain or improve connectivity.* (MMAH, 2005c, p. 30)

The wording "where reasonable" is ambiguous and will do little to adequately maintain or improve connectivity.

Section 4.3.2 Non-renewable resources policies states, for lands within the Protected Countryside, the following policies apply:

> 3. Notwithstanding the Natural System policies of section 3.2 of this Plan, within the Natural Heritage System, mineral aggregate operations and wayside pits and quarries are subject to the following:
> c) Any application for a new mineral aggregate operation, or the expansion of an existing mineral aggregate operation shall be required to demonstrate:
> i. *How the connectivity between key natural heritage features and key hydrologic features will be maintained before, during and after the extraction of mineral aggregates*;
> d) An application for the expansion of an existing mineral aggregate operation may be permitted in the Natural Heritage System, including key natural heritage features and key hydrologic features, and in any associated vegetation protection zone only if the related decision is consistent with the PPS.
>
> 6. Final rehabilitation in the Natural Heritage System will meet these additional provisions:
> c) Rehabilitation will be implemented so that the *connectivity of the key natural heritage features and the key hydrologic features on the site and on adjacent lands will be maintained or restored, and to the extent possible, improved.*

As with the ORM Plan, aggregate extraction is allowed within natural heritage systems but maintaining connectivity is now a planning consideration. Applications must show how connectivity will be maintained before, during and after extraction.

Despite the large size of the Greenbelt, there are calls to make it larger (Carter-Whitney, 2008). Ontario Nature, which holds a seat on the Greenbelt Council, views the Greenbelt as a "valuable building block" for a much broader greenway that it envisions as a system of core areas and connecting corridors throughout southern Ontario. Ontario Nature recommends adding lands to the Greenbelt and harmonizing the land use policies of the Greenbelt Plan, Oak Ridges Moraine Conservation Plan, and Niagara Escarpment Plan to preserve the strongest policies of each (Ontario Nature, 2006).

One of the outcomes of the Oak Ridges Moraine law and the Greenbelt law is a movement of land development to areas beyond these areas. This moves the development pressure to other areas of the province that are on the outer fringe of the Oak Ridges Moraine and Greenbelt area. For example, land use decisions made in relation to the ORM Act and Plan have been criticized for transferring urban development onto other ecologically sensitive areas, rather than reducing urban expansion as a whole.

Provincial Policy Statement 2005

The PPS 2005 contains three landscape connectivity statements. The PPS 2005 directs planners as follows:

> 2.1.2. The diversity and *connectivity of natural features* in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, *should be maintained, restored or, where possible, improved*, *recognizing linkages* between and among *natural heritage features and areas*, *surface water features* and *ground water features (MMAH, 2005a, p. 15)*.
> 2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:
> e) *maintaining linkages* and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas *(MMAH, 2005a, p. 16)*.

Thus the PPS directs planners to maintain, restore or, where possible improve, connectivity. The third landscape connectivity statement is found in the definition of "natural heritage system",

> Natural heritage system: means a system made up of natural heritage features and areas, *linked by natural corridors which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species and ecosystems.* These systems can include lands that have been restored and areas with the potential to be restored to a natural state *(MMAH, 2005a, p. 33).*

As explained in Chapter 4, the creation of the PPS 2005 coincided with the effective date of Section 2 of the *Strong Communities (Planning Amendment) Act, 2004*, which was brought in by the Liberal Government of Premier McGuinty and requires that planning decisions on applications that are subject to the new PPS "shall be consistent with" the new policies (MMAH 2007). Thus planners are required to be consistent with the policies of the PPS 2005, which include the concept of landscape connectivity. The wording of the actual policies is problematic, however. The policy regarding water is straightforward: planning authorities *shall* protect, improve or restore the quality and quantity of water by maintaining linkages, and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas. The policy regarding natural heritage is less straightforward: the diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, *should* be maintained, restored or, *where possible*, improved*, recognizing* linkages between and among *natural heritage features and areas*, *surface water features* and *ground water features. Using "should" instead of "shall" renders the statement advisory in nature. The vague language such as "where possible" and "recognizing linkages" does not provide adequate guidance for planners. Such language can also be used to avoid dealing with the issue of connectivity. This language becomes more worrisome in light of the fact that the PPS*

2005 requires planners to balance the protection of natural heritage with other matters of provincial interest, such as the protection of minerals and petroleum. Some contend that the PPS 2005 gives access to aggregate resources priority over other land uses (Environmental Commissioner of Ontario, 2005; Environmental Commissioner of Ontario, 2007; Winfield and Taylor, 2005). Existing and new mineral aggregate resource extraction is currently allowed in natural heritage systems and features. The protection of mineral aggregate resources trumps other land uses, such as natural heritage protection and agriculture. The wording of the PPS is such that it favours protection of mineral and petroleum resources and mineral aggregate resources over natural heritage protection. For example, the following is a new addition to the PPS 2005,

> *2.5.2.1. As much of the mineral aggregate resources as is realistically possible shall be made available to markets as close as possible. Demonstration of need for mineral aggregate resources, including any kind of supply/demand analysis, shall not be not required,* notwithstanding the availability, designation or licensing for extraction of mineral aggregate resources locally or elsewhere *(MMAH, 2005a, p. 19).*

*As noted by the Coalition on the Niagara Escarpment, "*Extraction is an extremely intrusive use of land, with long-term impacts on natural heritage systems. It is inconceivable that such a destructive activity could take place without a rigorous analysis of demonstrable need for the products that result from the extraction in question" (*Coalition on the Niagara Escarpment,* 2004, p. 4). The PPS 2005 also considers mineral aggregate operations to be "interim" land uses, which is a difficult position to support given their ecologically destructive nature and the extremely long time frame necessary for rehabilitation (see Winfield and Taylor, 2005 for a discussion of aggregate conservation in Ontario). This is just one example of the imbalance of the policies in the PPS 2005 and it is presented here to illustrate the potential challenges

facing planners who undertake to plan for landscape connectivity, given the wording and weighting of the policies.

Niagara Escarpment Plan 2005

There are 29 landscape connectivity statements in the NEP 2005. Most of these statements are the same as in the NEP 1994. One of the several new or revised landscape connectivity statements in the NEP 2005 mentions fragmentation,

> 5. New lots may include the Escarpment Natural or Escarpment Protection Areas designation under the following circumstances:
> a) Correcting conveyances;
> b) Where the land in the Escarpment Natural Area or Escarpment Protection Areas has, or is to be, acquired by a public body or an approved conservation organization; or
> c) Enlarging existing lots provided that *no further fragmentation* of the Escarpment Natural or Escarpment Protection Areas would result and provided there is sufficient area in the Urban Area to accommodate the proposed development. (p. 28)

This statement protects the Escarpment Natural and Protection Areas from further fragmentation as a result of enlarging existing lots.

Ontario Biodiversity Strategy, 2005

The Ontario Biodiversity Strategy contains 12 landscape connectivity statements. There are several descriptions of habitat fragmentation and the importance of maintaining natural systems to conserve biodiversity. There are four "Recommended Actions" that feature landscape connectivity. For example,

> Recommended Action:11. Implement the Greenbelt Protection Act and its related greenbelt plan to enhance the conservation of biodiversity by:
> • Generally protecting greenspaces and farmland within the Greenbelt's Protected Countryside area
> • Identifying and protecting a Natural Heritage System, including Key Natural Heritage Features and Key Hydrologic Features
> • Preventing the expansion of settlement areas within the Natural Heritage System and Specialty Crop areas
> • *Supporting connectivity within the Natural Heritage System and between key features* (OMNR, 2005, p.30).

> Recommended Action: 24.*Work to re-establish and/or retain natural linkages and connectivity on the landscape between natural areas*, including protected areas, with a high priority on reducing landscape-level habitat fragmentation in southern Ontario, through the securement of lands by such mechanisms as conservation easements, donation, purchase, protected areas and/or long-term leases (e.g., Great Lakes Conservation Blueprint, Big Picture 2002, Algonquin to Adirondacks, Greenways Strategy, Conservation Authorities and the Ontario Heritage Foundation)(OMNR, 2005, p. 35).
>
> Recommended action: 25.Develop a natural spaces initiative for southern Ontario to help Ontarians *conserve and restore over time a network of natural systems* (land and water) that:
> • Will support provincial and municipal land use planning initiatives
> • Respects private landowners' interests by working with willing landowners on a voluntary basis
> • Recognizes the need for strategic public investment and incentives (OMNR, 2005, p. 35)

These recommendations support landscape connectivity measures of both provincial initiatives (e.g. the *Greenbelt Act* and the Natural Spaces Program) and non-governmental organizations (e.g. Algonquin to Adirondacks and the Greenways Strategy). Of these recommendations, the *Greenbelt Protection Act* (Action 11) and the Natural Spaces Initiative (Action 25) are identified as Priority Actions for 2005.

However, the Ontario Biodiversity Strategy does not state which ministries are responsible for implementing the 37 recommended actions, nor does it contain timelines for any implementation measures (Environmental Commissioner of Ontario, 2005; Environmental Commissioner of Ontario, 2008). As one commenter stated, in response to the posting of the strategy on the Environmental Registry, "This needs to be corrected by ensuring that this is a *provincial* policy, and not just an MNR policy that can be largely ignored by other ministries" (Environmental Commissioner of Ontario, 2005, p. 70). No new priority actions have been identified since the OBS was released in 2005. Many of the "small steps" that the Government of Ontario has taken involve "off-loading responsibilities to third parties, such a non-governmental organizations or volunteer committees", which constitutes a disappointing sidestepping

of provincial responsibility for biodiversity (Environmental Commissioner of Ontario, 2008, p. 80). Instead, the Environmental Commissioner of Ontario recommends, "all prescribed ministries develop detailed action plans that specify the measures to conserve biodiversity that they will undertake" (Environmental Commissioner of Ontario, 2008, p. 82).

Places to Grow: Growth Plan for the Greater Golden Horseshoe, 2006

Prepared under the *Places to Grow Act*, this is a framework for implementing the Government of Ontario's vision of building stronger, prosperous communities by better managing growth in this region to 2031 (Ministry of Public Infrastructure Renewal, 2006). The vision for the Greater Golden Horseshoe (GGH) includes a "healthy natural environment" in which the "Greenbelt, including significant natural features, such as the Oak Ridges Moraine and the Niagara Escarpment, has been enhanced and protected in perpetuity" to "form the key building blocks of the GGHs natural systems" (Ministry of Public Infrastructure Renewal, 2006). The Plan however contains no specific policies for conserving natural systems, nor does it discuss sustainability or any limits to growth (Environmental Commissioner of Ontario, 2005). The Plan includes only two landscape connectivity statements, one of which simply states that the Designated Greenfield Policy is not meant to provide policy direction for the protection of natural heritage features, areas and systems. The other statement is found in Section 4.2 Policies for Protecting What is Valuable, under Natural Systems, and it states;

> Planning authorities are encouraged to identify natural heritage features and areas that complement, link or enhance natural systems.

This direction imparted by this statement is advisory in nature (planning authorities are "encouraged" to identify links) and does not offer protection for landscape connectivity. This is not surprising, given that the *Places to Grow Act* has

been assessed as "poking large holes in the nature conservation agenda" (Wekerle et al., 2007, p.31). The Places to Grow Plan was launched at the same time as the Greenbelt Plan but without the citizen's advisory committee, public consultation, and media attention. By arguing that the Greenbelt Plan and Places to Grow Plan needed to be dealt with and passed at the same time;

> …the provincial government managed to conflagrate two pieces of legislation in the public's mind and, perhaps, dampens the scrutiny and potential opposition to growth from both citizens and municipalities. By linking the Greenbelt Plan, widely perceived as a pro-conservation policy document, with the pro-growth agenda of the Places to Grow Act and its accompanying plan for the Greater Golden Horseshoe, the Provincial government has been able to pacify public concern over the environmental consequences of unchecked growth and justify the need for regional control of planning**,** while ensuring that any discussion of conservation is embedded within the context of inevitable growth (Wekerle et al, 2007, p. 32).

Given this context, it is perhaps a testament to the growing acceptance of the concept of landscape connectivity in Ontario's land use planning that the concept was included at all in the Places to Grow Plan.

Appendix D: Analysis of Ontario Municipal Board Decisions

OMB File Number(s): PL000159
Decision Number: 0119 **Issue Date:** January 25, 2001
Board Member(s): W.R.F. Watty
Landscape Connectivity Terms: "wildlife corridor linkage"
Overview: This case involved a development proposal for a private residential subdivision of 189 single story units, located adjacent to the EC Drury Campus Property and the Milton Tennis Club in the Town of Milton. The natural heritage issue in this case involved a 4.5 hectare wooded area planted in 1967.
Position of Parties: Appearing in opposition were the Town of Milton, the Friends of EC Drury Park, the Parents of EC Drury School for the Deaf School Council and the Ontario Deaf Sports Association.
Government Agencies: n/a
Notes:
Landscape Connectivity Policies and Legislation: Natural Heritage Reference Manual.
The arborist for the appellant used the Natural Heritage Reference Manual to assess the wooded area and found that it met none of the criteria for significance. The arborist for the Town of Milton argued that, with proper management, the ecological qualities of the woodlot could be improved. With regard to landscape connectivity, he highlighted the "potential for a wildlife corridor linkage between the tributary of Sixteen Mile Creek to the southwest and the woodlot".
Decision, Interpretation and Application of Landscape Connectivity Policies: Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL000128
Decision Number: 0166 **Issue Date:** February 1, 2001
Board Member(s): Rosenberg
Landscape Connectivity Terms: "significant corridor", "valley corridor", "corridor functions", "linkage", "significant linkage", "link", "open space linkage", "park links", "linkage for wildlife", "connection between the woodland and woodlot", "fragmented land parcels", "fragmentation",
Overview: This case involved a development proposal to build two apartment buildings on a vacant parcel of land owned by the applicant in the City of London. The applicant requested a change in the Official Plan designation from "Open Space" to "Multi-Family High Density Residential" and rezoning for the property from Open Space to Residential.
Position of Parties: The City of London and a number of residents and ratepayers associations opposed the redesignation and rezoning and wished for the property to remain Open Space.
Government Agencies: The MMAH and the Upper Thames River Conservation Authority had no comment on the application. A natural hazard planner for the Upper Thames River Conservation Authority gave evidence to the Board under subpoena in opposition to the proposed rezoning. There was no mention of landscape connectivity.
Notes: Planners for the applicant argued that the subject property did not have a natural heritage designation in the Official Plan, was not a significant natural heritage feature and was not a "significant corridor". They noted that the biological function of the site was that of "an isolated patch of habitat disjunctive from the broader Thames River Corridor for typically occurring species". They stated that there were "no significant linkages" between the subject property and "Springbank Park, or the Thames River, but there is a link to Reservoir Hill the east which linkage will still be maintained".

Planners for the opposition argued that the subject lands met the criteria for a significant woodland, under test of Section 2.3.3 of the PPS and the Natural Heritage Reference Manual, and that the application did not adhere to the PPS as the proposed development would cause negative impacts on the natural features and ecological functions of the significant woodland. They acknowledged that "in the past twenty years, the importance of valley corridors is stressed and more emphasis is on environmental issues". They further argued that,

> Provincial Policy Statement Section 2.3.1 and 2.3.3 has not been met. Development on the site would result in a loss of physical and natural features on the site and increase the distance and physical barrier or separation with the natural features of Springbank Park by perpetrating the loss of corridor functions.

Thus the opposition cited landscape connectivity, as required by the PPS, as one of the reasons that the development proposal should be disallowed.

An ecologist gave evidence in opposition to the proposed rezoning. He stated that the property provided significant ecological features and functions and that the site of the proposed development was indeed a significant woodland. He stated that the proposed development would result in a net negative impact on ecological features and functions, including "effect on the corridor function provided by the woodland communities". A forester also gave evidence in opposition to the proposed rezoning. He stated that the subject property "is an important linkage to Reservoir Hill and Springbank Park" related to "animals like foxes, birds and squirrels". He voiced concern over fragmentation if remaining patches were eliminated.

Landscape Connectivity Policies and Legislation: Board Member Rosenberg found Section 2.3.1 of the PPS had been adequately addressed and that the subject lands were not a significant woodlot, not an environmentally sensitive area (ESA) and not an important wildlife habitat. With respect to landscape connectivity, Board Member Rosenberg found that "there is no significant linkage to Springbank Park" and "Linkage to Reservoir Hill will still be maintained".

Decision, Interpretation and Application of Landscape Connectivity Policies: Board Member Rosenberg used landscape connectivity terms inappropriately. For example, he stated that,

> Section 8 of the Official Plan has been complied with because park links and open space linkage will still be maintained in Reservoir Hill and Springbank Park. The main linkage for wildlife is in an east-west direction on Springbank Park. There is no shortage of open space in this area of the City of London. Ecological features of the two parks are still protected.

In this statement, he used the terms "park links", "open space" and "wildlife linkages" interchangeably. These terms are not equivalent to each other. For example, open space is not to the same as a wildlife linkage, though some species may be able to move through open space from one habitat patch to another. The incorrect usage of landscape connectivity terms raises the possibility that Board Member Rosenberg may have been confused by the terminology, which may, in turn, have affected the final ruling.

Ultimately, the Board allowed the appeals in part. One 12-story apartment building was approved. Board Member Rosenberg found that the Thames River Valley Corridor would not be impacted by this revised development and that the "Thames River Valley Corridor would continue to act as the City of London's most important natural, cultural and aesthetic resource". The Board preferred the testimony given in favour of the application.

OMB File Number(s): PL980875
Decision Number: 0716 **Issue Date:** May 7, 2001
Board Member(s): J.R. Boxma
Landscape Connectivity Terms: "natural heritage corridor", "greenways"
Overview: This case involved a development proposal to change the land use designation of 90 acres in the City of Guelph from "Corporate Business Park" to "General Residential".
Position of Parties: The City of Guelph opposed the change.
Government Agencies: n/a
Notes: The land use planner for the City described a "natural heritage corridor" to the southeast of the subject property. The planner for the appellant suggested that the subject property "should be isolated from the remaining industrial and Corporate Business Park lands and separated by greenways." These were the only two mentions of landscape connectivity.
Landscape Connectivity Policies and Legislation: n/a

Decision, Interpretation and Application of Landscape Connectivity Policies: Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL000560
Decision Number: 0287 **Issue Date:** February 14, 2002
Board Member(s): S. Fish
Landscape Connectivity Terms: "wildlife corridors"
Overview: This case involved a proposal by Gold Mountain Springs Inc. to amend the official plan and zoning by-law to permit a 100,000 sq ft water bottling plant in the Township of Oro-Medonte.
Position of Parties: The Township opposed the change, as did adjacent and nearby landowners.
Government Agencies: n/a
Notes: The Gold Mountain site was described as being "heavily wooded and…part of established wildlife corridors that connect to the heights of the Oro Moraine". Area residents gave the Board extensive evidence of rare and unusual plants, birds and animals in the area. The environmental planner appearing for Gold Mountain acknowledged that "any interior species now on the site will likely be disturbed by the development, and that existing wildlife corridors may be interrupted".

Landscape Connectivity Policies and Legislation:
Board Member Fish referred to the *Planning Act* and the PPS, but not specifically with regard to landscape connectivity.
Decision, Interpretation and Application of Landscape Connectivity Policies:
Board Member Fish dismissed the appeals. She stated, among other things, that the proposed development "does not meet the stated intent of the Provincial Policy Statement" and "is not reasonable, appropriate or in the public interest".

OMB File Number(s): PL000875
Decision Number: 0513 **Issue Date:** May 7, 2002
Board Member(s): Daly
Landscape Connectivity Terms: "connectivity or linkage between features", "wildlife corridors", "natural linkage and migration corridors", "corridor"
Overview: This case involved a proposal to approve a Secondary Plan for the development of Snow Valley, on a 1700-hectare site west of the City of Barrie in the Township of Springwater. The primary issues in the Board hearing were based on potential impacts to natural heritage and agriculture from development areas proposed for the uplands portion of the Secondary Plan.

Position of Parties: The County of Simcoe argued that the Secondary Plan did not adequately consider development impacts on significant woodlands, significant valleylands and significant wildlife habitat. One of the County's concerns was "Adequacy of consideration through Official Plan Amendment No. 12 for wildlife corridors and forest interior habitat in Development Area 12". Both the County Ecologist and Environmental planner advised of concerns with development in this area based on connectivity with lands to the east. They see no difference in terms of forest cover maturity, forest composition, and contribution to habitat than areas to the south and east proposed to be within the *Natural Heritage (Environmental Protection)* designation.
Government Agencies: Conservation Authority (NVCA)
Notes: The Township of Springfield's Official Plan Section 16.2.1.1. created a two-tier approach to environmental protection. Category 1 lands were given highest the highest protection and were zoned in a separate category in implementing by-laws; they included ANSIs, wetlands, significant ravines, and habitats of endangered species. Buildings were not permitted and uses were very limited. Category 2 lands were not specifically designated and retained their underlying land use designation; they included natural linkage areas, lands adjacent to wetlands, and fish habitat. Development was permitted "upon satisfaction that negative impacts will not occur"; this wording was based on policies contained in the PPS. Thus, landscape connectivity was identified in the Official Plan but was given secondary protection, based on the Township's interpretation of the PPS.
"The Board accepts that the appropriate time to fine tune and clarify the extent of development is at the zoning and draft plan of subdivision stage where a more complete investigation of the top of bank will occur. It is clear that this investigation will respond to issues associated with the significant valleyland feature to the north, as well as recognition of the wildlife corridor."
Landscape Connectivity Policies and Legislation: The key provincial policies identified by Board Member Daly as being at issue for the hearing were under Section 2.3 Natural Heritage of the PPS 1997. With regards to landscape connectivity, Board Member Daly stated, "Policy 2.3.3 demands an investigation of the diversity of features in an area and the connectivity or linkage between features. They are to be maintained and where possible improved". Thus, the Board identified the PPS's landscape connectivity policy as being central to the hearing.
Decision, Interpretation and Application of Landscape Connectivity Policies: The Board is fully satisfied that with respect to all matters noted above, both individually and collectively, the proposed Secondary Plan respects and has regard for provincial policy, and is in conformity with both the County and local Official Plans. In all respects, the Board is satisfied that the proponent has demonstrated there will be no

negative impacts on the relevant natural features and ecological functions identified by the Secondary Plan. The Board is also confident that OPA 12 establishes an appropriate framework for important detailed environmental impact assessment yet to occur. Concern with Development Area 13 leads the Board to conclude that development shall be restricted to areas north of the gulley/valley feature currently identified as *Natural Heritage (Environmental Protection)* on Exhibit 89(a) as filed.

OMB File Number(s): PL000597
Decision Number: 0886 **Issue Date:** June 28, 2002
Board Member(s): D.R. Granger
Landscape Connectivity Terms: "wildlife corridor", "corridor", "linkage", "Greenland Linkage"
Overview: This case involved a proposed plan for a residential subdivision.
Position of Parties: The Town of Bradford-West Gwillimbury opposed the development, as did the County of Simcoe. Area residents, represented by farmers and a group known as S.P.R.A.W.L., also opposed the development.
Government Agencies: n/a
Notes: "Of particular concern to area residents was the maintenance and protection of the existing wooded areas and especially the proposed Greenland Linkage along Scanlon
Creek between Cookstown Hollow and the Holland Marsh. These matters now rest with the future management of the lands within the agricultural area together with any conservation regulations. The County Greenland designation does not affect the subject land and the proposed Greenland Linkage L5 is not a land use designation. It is intended to implement this linkage through a variety of stewardship approaches and the consideration of applications for land use change. Similarly in the new Town OP, policy 4.8.1 sets out that wildlife corridors will be protected against interruption when new or enlarged developments are under consideration."

Landscape Connectivity Policies and Legislation: PPS 1997

Decision, Interpretation and Application of Landscape Connectivity Policies:
Board Member Granger dismissed the appeals. "On all of the evidence presented and having regard for the Provincial Policy Statement and subsection 51 (24) of the *Planning Act*, the Board finds that proposal does not conform to the applicable OP, is not appropriate, does not represent good planning and is not in the overall public interest of the community."

OMB File Number(s): PL010559
Decision Number: 1352 **Issue Date:** October 3, 2002
Board Member(s): N.C. Jackson
Landscape Connectivity Terms: "corridor function"
Overview: This case involved a proposal to develop a subdivision on 30 acres in the City of Ottawa.
Position of Parties: The City of Ottawa supported the application for draft subdivision approval and implementing zoning. The Quarry Forest Preservation Committee opposed both rezoning and draft subdivision approval.
Government Agencies:
Notes: A terrestrial biologist, testifying on behalf of the City of Ottawa,
Landscape Connectivity Policies and Legislation: n/a
Decision, Interpretation and Application of Landscape Connectivity Policies: Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL020107
Decision Number: 1696 **Issue Date:** December 12, 2002
Board Member(s): J de P. Seaborn
Landscape Connectivity Terms: "corridor", "river corridor", "corridor functions", Thames River corridor, "corridor interruptions", "vegetated riparian corridor", "linkage", "open space linkage", "natural connections",
Overview: This case involved a development proposal for 1.9 hectares of vacant land on the Thames River in the City of London.
Position of Parties: The City of London refused to approve an Offical Plan amendment and refused to rezone the lands. The refusal was based on the desire to maintain the area as Open Space and the prematurity of the amendments in the absence of a sufficient environmental impact study. The potential for the development to impact natural heritage features and the Thames River corridor was a significant issue at the hearing for both the City and area residents.
Government Agencies: Upper Thames River Conservation Authority (under subpoena)
Notes: "The Council resolution stated:
i) it being noted that notwithstanding the recommendation of the Commissioner of Planning and Development, the refusal is based on Council's desire to maintain the Open Space (OS4) zone and the prematurity of the requested amendments in the absence of a complete and sufficient environmental impact study to demonstrate that the proposed development will not negatively impact the river corridor with regard to the following matters:
ii) Definition of the corridor functions provided on the site and demonstration that these functions will be maintained post development;
iii) Identification of the development limit and justification for that limit based on potential impacts of development and proposed mitigation;
iv) Identification of potential impacts of the Natural Heritage System (ie vegetation/tree removal on the river corridor) and identification of mitigation strategies;
v) Evaluation of the storm water management outlet (channel), with recommended mitigation/restoration plan to address impacts; and
vi) Identification of potential impacts of fill, grading and vegetation removal and mitigation/restoration plan to address those impacts.
Addressing these issues formed the basis of much of the expert evidence presented during the course of the hearing."
"The Board has also considered the position of the UTRCA which was that the existing habitat is not significant for the Spiny Softshell Turtle and no Queen Snakes have been found basking in the area. While Mr. De Young and others suggested that the importance of the habitat has been underestimated by the UTRCA, the protection of the 30 metre corridor and the ability of the UTRCA to require adequate mitigation measures as part of the site plan approval stage will afford adequate protection. In arriving at this finding, the Board has considered the testimony of Mr. De Young and the area residents, many of whom enjoy the site as a nature area. The Board however cannot ignore the fact that the site is also in a major City, in close proximity to urban development and public recreation facilities, including parks and walking and biking trails. The site has not qualified under the City's policies as an ESA, potential ESA, or ANSI nor did the evidence suggest it should be designated as such. The evidence did not identify the site as habitat for threatened or endangered species. It is also significant in the Board's view that the site was formerly occupied for commercial and industrial purposes until the most recent fire, in 1983."

Landscape Connectivity Policies and Legislation:
"The City and Ms McGregor took the position that the amendments sought do not conform to the provisions of the PPS or the Plan with respect to natural heritage features. The PPS stipulates in Policy 2.3.1 that **"***natural heritage features and areas will be protected from incompatible development".* Development and site alteration may be permitted in fish habitat and significant wetlands, woodlands, valleylands, wildlife habitat, areas of natural and scientific interest "*if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which the area is identified"* (Policy 2.3.1 b)). *S*imilarly, under Policy 2.3.2 development and site alteration may be permitted on adjacent lands to the areas identified in 2.3.1, with the same proviso respecting impacts. Finally, under Policy 2.3.3 "*the diversity of natural features in an area, and the natural connections between them should be maintained and improved, where possible".*

Decision, Interpretation and Application of Landscape Connectivity Policies:
"Based on a consideration of all of the evidence the Board finds that the development proposal constitutes good planning, has regard for the provincial interest and the Provincial Policy Statement, conforms to the policies contained in the Official Plan and should be approved. In arriving at this decision, the Board has considered all of the evidence, including the positions and submissions of those parties opposed to the project… In arriving at its decision to modify and approve the Plan and amend the By-law, the Board also relies on Rival's intention to convey surplus lands to the City, which will ensure there is at least a 30 metre corridor along the bank of the Thames River that will remain in the Open Space designation and continue to be accessible to the public."

OMB File Number(s): PL001187, PL010286
Decision Number: 1768 **Issue Date:** December 30, 2002
Board Member(s): B.W. Kruskelnicki
Landscape Connectivity Terms: "small corridor of natural lands", Cedar Creek corridor,
Overview: This case involved a proposal to develop a golf course in a wooded area in the Town of Essex. The site was identified by the local Conservation Authority as an Environmentally Significant Area in an early 1990s inventory.

Position of Parties: The proposal was opposed by a local group of farmers, rural residents and environmentalists known as "Friends of Marshfield Woods". The Town of Essex approved the applications.
Government Agencies: The MNR identified the lands as a Provincially Significant wetland.
Notes: "Essex is clearly deficient in comparison with the rest of Southern Ontario. There are green areas along the lakeshores, especially at Point Pelee and a small corridor of natural lands appears diagonally along the Cedar Creek. Together these form the only significant areas of forest cover and natural area. Marshfield Woods forms a part of the Cedar Creek corridor."
Landscape Connectivity Policies and Legislation: n/a

Decision, Interpretation and Application of Landscape Connectivity Policies: Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL011160
Decision Number: 0455 **Issue Date:** April 9, 2003
Board Member(s): J.G. Daly and N.M. Katary
Landscape Connectivity Terms: "corridor linkages", Grand River Corridor Conservation Plan, Grand River corridor, "important corridors and linkages", "corridor", "corridors for the movement of birds, wildlife and flora", "linkage functions"
Overview: This case involved a proposal for development of a golf course in the City of Kitchener and the City of Cambridge.
Position of Parties:
Government Agencies: Grand River Conservation Authority
Notes: "The areas of particular environmental concern which the Board finds relevant are: the existence of a provincially significant wetland on the property; the existence of rare and endangered species of flora and fauna; maintenance of important corridors and linkages; and ongoing environmental monitoring."
"In addition to human activity, the lands have served as wildlife habitat for centuries. The Grand River corridor represents a particularly healthy ecosystem that includes at this location habitat for bald eagles, great egrets, wood ducks, azure aster, swamp candles, and a multitude of other species of plant and animal, some common, some not so. The importance of this cultural and natural heritage dominated the hearing process, and guides this decision."
"4 Ecosystem Diversity and Corridor Linkages
Grand River Conservation Authority representatives expressed concern for the Grand River corridor and Cambridge's consultant echoed this. They pointed to regional and local policy to advise that no change is the best approach. They particularly rely on Cambridge Official Plan policy, which prohibits alteration of ESPA areas. This is the policy under appeal, and is therefore not a policy in effect at the time of the application. The Board was asked to consider it nonetheless. It is clear that regional and local policy encourage ecosystem diversity. This is to be done at both the site level and on a large network scale. All acknowledge the Grand River as a corridor. The acknowledgement of significant valley land, and the existence of the Environmentally Sensitive Policy Area and its connection substantiate this. The functions of this corridor were well documented through the evidence in the hearing. Kitchener does not see the proposal as impacting any of the linkage functions. They suggest that environmental rehabilitation of the sort they propose will enhance this function.

Landscape Connectivity Policies and Legislation:
PPS 1997 Policy 2.3
Decision, Interpretation and Application of Landscape Connectivity Policies:
"Corridors for the movement of birds, wildlife and flora along the Grand River will not be degraded by this proposal. The intent to naturalize some areas now under cultivation will reinforce this goal. The Board is fully satisfied that the Grand River Corridor will not be degraded by this proposal, but will be enhanced through an aggressive environmental management process regulated by the Region and implemented by Kitchener. Policy 4.1 of the Regional Plan is not offended by this proposal."

OMB File Number(s): PL021111
Decision Number: 1222 **Issue Date:** September 15, 2003
Board Member(s): N.C Jackson and J.R. Aker
Landscape Connectivity Terms: "connectivity", "Natural Linkage Area",
Overview: This case involved a proposal to change the zoning for a property located in the Oak Ridges Moraine in order to permit a private boarding and kennel facility for dogs. The primary issue in the hearing was conformity with the *Oak Ridges Moraine Act* and the Oak Ridges Moraine Conservation Plan. This hearing was one of the first times that the OMB reviewed an appeal which had to conform to this new legislation.

Position of Parties: The Township of Adjala-Tosorontio took the position that there is no limit on the number of dogs that may be kept on a property but that each animal ought to be licensed. The evidence was that none of the animals were licensed individually and the Ryans had chosen to apply for an amendment to the Zoning by-law to permit a private boarding/kennel as a distinct use. The Township opposed the proposal on the grounds that it did not conform to the Oak Ridges Moraine Conservation Plan.
Government Agencies: MMAH
Notes: The planner for the appellant testified that there were no natural features on the property that should be protected, citing that there was no watercourse and limited woodland on the property. However, Board Member Jackson found that, based on the evidence, there were clearly "features such as woodlands, watercourses and animal activity that would justify some analysis that the ecological integrity of the Plan Area would not be affected".
Landscape Connectivity Policies and Legislation: The subject property was located in a Natural Core Area. With regard to landscape connectivity, Section 11(1) of the Oak Ridges Moraine Conservation Plan states that the purpose of Natural Core Areas is to maintain and, where possible, improve or restore the ecological integrity of the Plan Area by,
a) Maintaining and, where possible, improving or restoring the health, diversity, size and connectivity of key natural heritage features, hydrologically sensitive features and the related ecological functions.

There was some debate over how to classify the business for the purposes of establishing whether or not it was an allowable use in Natural Core Areas. Board Member Jackson acknowledged that accessory uses under Section 11 of the Oak Ridges Moraine Conservation Plan, such as home businesses and home industries, may be required under Section 20 to prove that planning, design and construction practices "ensure that no buildings or other site alterations impede the movement of plants and animals among key natural heritage features, hydrologically sensitive features and adjacent land within Natural Core Areas". Thus the proposal for the kennel was required to prove that it would not impede connectivity.

Decision, Interpretation and Application of Landscape Connectivity Policies: Board Member Jackson was not satisfied that the analysis prepared by the proponent had "done more than to consider the subject property when the analysis ought to consider the context of the Plan Area with specific reference to the natural features that surround the subject property". The failure to consider the subject property's relationship to surrounding features was cited as one of the reasons that Board Member Jackson found that the proposal did not conform to the Oak Ridges Moraine Conservation Plan and, thus, the appeal was dismissed. This decision is important to

landscape connectivity as it demonstrates that the Board was willing, when warranted, to look beyond the boundaries of the property at issue and consider the ecological impacts that development might have on the surrounding area, including potential impacts on wildlife and plant movement.

OMB File Number(s): PL010909
Decision Number: 0188 **Issue Date:** January 30, 2004
Board Member(s): R.E. Drury
Landscape Connectivity Terms: "natural connections"
Overview: This case involved an appeal of the passing of a zoning by-law.
Position of Parties:
Government Agencies: MNR
Notes:
Landscape Connectivity Policies and Legislation: Section 2.3 Natural Heritage section of the PPS was cited but landscape connectivity was not a factor in this case

Decision, Interpretation and Application of Landscape Connectivity Policies: Landscape connectivity was not a factor in this decision.

OMB File Number(s): PL030097
Decision Number: 0784 **Issue Date:** April 20, 2004
Board Member(s): R.A. Beccarea
Landscape Connectivity Terms: "landscape connectivity", "continuous, undisturbed block of wildlife habitat"
Overview: This case involved a proposal to develop a 20.65 hectare property in the Town of Inisfil as a residential subdivsion with 319 dwellings. The Town refused to approve the official plan amendment, zoning by-law amendment and draft plan of subdivision.

Position of Parties: The official plan amendment proposed a reduction in size and configuration of that portion of the subject lands designated as Environmental Protection Area, based on the appellant's claim that the "locally significant wetland" therein was not, in fact, locally significant. The Town disagreed and preferred to allow the wetland and woodland features to remain in their natural state. Both the Town and the Lake Simcoe Region Conservation Authority supported the locally significant designation of the wetland.

Government Agencies: Lake Simcoe Region Conservation Authority
Notes: An environmental planner for the appellant advised the Board that the construction of a modified wetland design, with a riparian buffer and mitigation measures, would provide a number of site enhancements, including "landscape connectivity with the natural channel designs proposed to the west and east of the subject property…". This alteration would allow the wetland area to "provide a continuous, undisturbed block of wildlife habitat through the entire width of the subject property". These statements demonstrate that the appellant recognized landscape connectivity as a positive concept and included landscape connectivity in their plan.

Landscape Connectivity Policies and Legislation: PPS 1997 Policy 2.3, Natural Heritage Reference Manual.
Decision, Interpretation and Application of Landscape Connectivity Policies: Board Member Beccarea preferred the evidence of the appellant and found that the wetland was not locally significant and thus the proposed reduction in the size and configuration of the wetland was approved. With regard to landscape connectivity, Board Member Beccarea found that the appellant had successfully proven that, "while the proposed reduction in size and configuration is significant, that the wetland area can be altered such that all pre-existing functions can be retained and as altered, provide a continuous, undisturbed block of wildlife habitat through the entire width of the subject property". Board Member Beccarea then continued on to state that the wetland was "not…significant from a biological perspective and does not perform any significant function or support significant features". Although these statements imply that the Board did not consider landscape connectivity to be a significant function, the decision did recognize landscape connectivity as positive site enhancement.

OMB File Number(s): PL010545
Decision Number: 0814 **Issue Date:** April 26, 2004
Board Member(s): R.J. Emo
Landscape Connectivity Terms: "functional connectivity"
Overview: This case involved development application for a small quarry operation in County of Bruce.
Position of Parties: The Township of Amabel's position was that it had responded to the Provincial Policy Statements (PPS) by designating, in the new SBPOP, a substantial area for aggregate development and that allowing a quarry west of the Rankin River system (RRS) would severely impact on this unique natural area as well as tourism and recreational activities on Spry Lake and the nearby Lake Huron shoreline. As the owner of the OEC, the Bruce District Sschool Board had concerns both as to the safety of its students from increased truck traffic and the impact on the RRS, which is an essential component of the OEC curriculum.

Government Agencies:
Notes:
A biologist, giving evidence in favour of the development, testified that she did not find "sufficient evidence of functional connectivity" to confirm the presence of a wetland complex.

"The Board notes for the record that the preamble to the current PPS contains an admonition that the PPS is intended to promote a policy-led system, which recognizes that there are complex inter-relationships among environmental, economic and social factors in land-use planning. This is certainly true in this situation. After a careful consideration of the planning evidence, the Board is of the view that while the dolostone on the Millers' property has value, its extraction is not crucial to Ontario's well being and that the principle of wisely managed growth dictates that resource activity in Rural areas is but one of several land-uses that are expected to co-exist in harmony. From this perspective, the Board finds that item 2.2.3.1 does not "trump" other PPS policy direction and that by designating large areas for future aggregate extraction, the Town has adequately responded to the PPS."

Landscape Connectivity Policies and Legislation: n/a

Decision, Interpretation and Application of Landscape Connectivity Policies:
"Having carefully reviewed the planning evidence, it is the Board's finding that the Town's desire to prevent any quarries west of the RRS has considerable merit and reflects the best planning in these particular circumstances. Accordingly, the appeal of COPA 2 is allowed and it is not approved. Accordingly the appeals seeking to amend the Amabel planning regime are dismissed and the Board's recommendation to the Minister is that the licence NOT be issued as the application does not represent good land-use planning."

OMB File Number(s): PL040088
Decision Number: 1428 **Issue Date:** September 2, 2004
Board Member(s): F.G. Farrell
Landscape Connectivity Terms: "hydrologically connected by a surface water connection", "surface water linkage",
Overview: This case involved an appeal of a proposed golf course development.
Position of Parties:
Government Agencies: n/a
Notes: The appellant stated that he believed the "Ashton Station Wetland and the Manion Corners Long Swamp Wetland were either hydrologically connected by a surface water connection and should therefore be complexed together or that the two are just one large continuous wetland." He "raised the plea for more time to investigate and research the matter". However, the Board noted that "no professional opinion evidence was contained in his affidavit material or produced at the hearing of this motion to support his position."

Landscape Connectivity Policies and Legislation: n/a

Decision, Interpretation and Application of Landscape Connectivity Policies: The Board agreed with the "professional opinion" of an engineer for the City of Ottawa that the claims of the appellant regarding surface water linkage, fish habitat and aquifer problems were not supported by any factual or scientific evidence.

OMB File Number(s): PL020603
Decision Number: 1678 **Issue Date:** October 21, 2004
Board Member(s): Stockton
Landscape Connectivity Terms: "essential natural connections", "significant planning connection", "connectivity", "significant natural heritage connections",
Overview: This case involved an appeal for a proposed Official Plan amendment for the Town of the Blue Mountains. The amendment would allow for a large resort development on a 620-hectare property.
Position of Parties: The Town, the County of Grey, and the Niagara Escarpment Commission (Allied Parties) were in favour of the appeal. The Castle Glen Ratepayers Association Inc. (Ratepayers) was opposed to the appeal. The subject lands were designated "Escarpment Recreation" under the Niagara Escarpment Plan, which permitted resort development. At issue in this hearing was a portion of the proposal related to the "non-deferred" lands below the brow of the Escarpment. The Allied Parties entered into Minutes of Settlement in February 2004 and a feature of that Settlement was that the lands above the brow of the Escarpment would be deferred until further study was completed. The Ratepayers were not a party to the Settlement and, along with a number of local residents, opposed the proposed development.
Government Agencies: Niagara Escarpment Commission, Nottawasaga Valley Conservation Authority

Notes: The Allied Parties and the Ratepayers had a fundamental disagreement on the planning approach to be taken with respect to natural heritage issues. The Allied Parties preferred what they described as a "drilling down" approach in which, at each stage of development, the required environment studies would become more and more specific. The Ratepayers preferred what they described as a "precautionary" or "environment-first" approach in which a greater level of study would happen prior to determining appropriate land use designations. The Ratepayers contended that it was inappropriate to proceed with any development on the non-deferred lands until all studies had been completed on the deferred lands above the brow of the Escarpment. Specifically, they felt that there had been insufficient study to show that there were no "essential connections" between the deferred lands above the brow and the non-deferred land below the brow of the Escarpment.

The applied ecologist who testified on behalf of the Ratepayers described himself as "subscribing to the principles of conservation biology, an emerging science, which involves an "environment-first" approach to land use planning. Although Board Member Stockton found the evidence of this witness to be "earnest, sincere, principled and professional", he described the witness as not being a qualified land use planner and, ultimately, the Board preferred the evidence of the many expert witnesses of the Allied Parties for their more extensive and "useful" level of study. The Board also preferred the evidence of the Allied Parties to that of the panel of experts who appeared on behalf of the Nottawasaga Valley Conservation Authority (NVCA), for apparently the NVCA's experts attended little of the hearing and had read few of the studies.

Landscape Connectivity Policies and Legislation: PPS 1997, Natural Heritage Reference Manual, Niagara Escarpment Plan and the *Niagara Escarpment Planning and Development Act*

According to the Board, much of the debate on environmental issues centred on the use of the Natural Heritage Reference Manual. All of the witnesses agreed that the Natural Heritage Reference Manual's Natural Heritage System approach represented

one method of giving effect to Section 2.3 of the PPS. The Natural Heritage Reference Manual describes four components of developing a natural heritage system:

> i) an inventory of steams, lakes, landforms, forest cover, vegetation, habitat, fish and wildlife, soil and geological information, and areas of existing development;
> ii) identification of natural heritage features and areas;
> iii) identification of areas requiring protection to maintain diversity and connectivity between natural heritage features; and
> iv) implementation of the Natural Heritage System within the planning context.

However, Board Member Stockton cautioned,

> While the use of the Natural Heritage Reference Manual appears to be widespread in environmental planning, it is important to remember that the Manual does not represent a policy document for planning purposes, nor is the use of a natural heritage system mandated.

This statement reflects the discretionary status of the Natural Heritage Reference Manual and the Board's willingess to accept approaches other than the natural heritage system.

Although the Allied Parties claimed to have used the Natural Heritage Reference Manual and a natural heritage system approach with respect to the mapping and policies in the draft Official Plan amendment, the Ratepayers argued that there was no evidence of this in any of the background reports. Board Member Stockton preferred the evidence of the Allied Parties and agreed that the "mapping demonstrates all of the results contemplated by the Natural Heritage Reference Manual".

The Ratepayers continued to maintain that "connectivity and diversity, both essential elements under section 2.3 of the PPS, had not been addressed in the draft Official Plan amendment". They argued that, 1) the subject property must be considered in the context of the natural features and functions of surrounding lands; and 2) by deferring the study of the lands above the brow of the Escarpment, the possibility of essential connections between those lands and the lands below the brow was being ignored. They argued that there was an incomplete understanding at the Official Plan level of the natural features and functions, such as landscape connectivity, of the subject lands.

Once again, however, Board Member Stockton preferred the evidence of the Allied Parties:

> Again, the Board accepts the evidence of the expert witnesses for Castle Glen that there are no significant natural heritage connections either within or extending beyond the subject property, or issues of diversity that would prevent the development proceeding in the area below the brow of the escarpment. Generally, the Board finds that a substantial amount of work has been done to date, sufficient to justify the mapping and policies contained in the draft Official Plan amendment, and specifically finds that issues of connectivity and diversity have been addressed.

Thus the Board recognized connectivity as a legitimate planning concern but ruled against the precautionary approach recommended by the Ratepayers.

Decision, Interpretation and Application of Landscape Connectivity Policies:

Board Member Stockton found that the Official Plan amendment had regard for the PPS and conformed to senior planning documents, namely the Niagara Escarpment Plan and the *Niagara Escarpment Planning and Development Act*. The decision took into account the need to balance the competing policies of the PPS and, in approving the Official Plan amendment, recognized the proposed development as maintaining "a proper balance between protection of the Province's natural heritage, and its economic future".

OMB File Number(s): PL040097
Decision Number: 0892 **Issue Date:** April 12, 2005
Board Member(s): M.C. Denhez
Landscape Connectivity Terms: "corridor", "Greenbelt", "partially linked through an attractive trail system",
Overview: This case involved a development proposal for a 22-storey residential tower between a designated heritage building and an Area of Scientific and Natural Interest (ANSI).
Position of Parties:
Government Agencies:
Notes: The Sawmill Creek Valley is a provincially-significant ANSI, whose ravine runs along the northern edge of the subject property. The City of Mississauga's Official Plan designated the ravine as "G" for greenbelt. The ravine was described as "an important part of the City's overall green system, as well as its trail system".
Landscape Connectivity Policies and Legislation: n/a

Decision, Interpretation and Application of Landscape Connectivity Policies:
Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL030958
Decision Number: 2472 **Issue Date:** September 21, 2005
Board Member(s): D.J. Culham
Landscape Connectivity Terms: "Natural Linkage Areas", "impedes the movement of plants or animals"
Overview: This case involved a proposal for a zoning by-law amendment that would allow the development of a new building on a 9.7 hectare site in King Township. The subject property was located in a Natural Linkage Area of the Oak Ridges Moraine Conservation Plan.
Position of Parties: King Township did not object to the application**.**
Government Agencies: n/a
Notes: An environmental planner testified in support of the application, arguing that "nothing in the this Application impedes the movement of plans or animals among the identified "key natural heritage features" and the "hydrological features".
Landscape Connectivity Policies and Legislation: Board Member Culham found that the application met all the requirements of the Oak Ridges Moraine Conservation Plan and Section 15 of the *Oak Ridges Moraine Conservation Act*. Board Member Culham also found that the application gave "appropriate regard" to the requirements of the PPS 1997, including Section 2.3 Natural Heritage..

Decision, Interpretation and Application of Landscape Connectivity Policies: The appeal was allowed. The decision summary provided little detail, therefore not much can be said about this decision beyond the fact that it recognized landscape connectivity as a planning issue in the case.

OMB File Number(s): PL050489
Decision Number: 2852 **Issue Date:** October 28, 2005
Board Member(s): K.J. Hussey
Landscape Connectivity Terms: "wetland/stream corridor", "fragmentation of agricultural lands", "fragment"
Overview: This case involved a severance proposal for a property located within an environmentally protected area.
Position of Parties: The owners of the property wished to create two parcels of twenty hectares each. The Durham Land Division Committee denied the application.
Government Agencies: n/a
Notes: "Celeste Terry, a qualified and experienced land use planner, gave evidence opposing the Application. Her opinion is that this proposal would create two non-viable agricultural parcels and fragmentation of agricultural lands. This, she said, does not conform to the intent of Region of Durham Official Plan (Plan), which supports agricultural uses as an important element in the region's heritage and economy. The Plan provides that the region should discourage fragmentation of the agricultural land base, and, in subsection12.3.14, states that a severance shall not be granted on the basis of lands being marginal agricultural land, environmentally sensitive lands or woodland"
Landscape Connectivity Policies and Legislation: Section 2.3 of the PPS 1997.

Decision, Interpretation and Application of Landscape Connectivity Policies:
Board Member Hussey dismissed the appeal.

OMB File Number(s): PL040816
Decision Number: 0062 **Issue Date:** January 9, 2006
Board Member(s): R. Rossi
Landscape Connectivity Terms: "hydrological connection"
Overview: "The subject matter before the Board is an appeal by Heather Brooks-Hill, Jeremy Carver, Virginia Thompson and others from a decision of the Committee of Adjustment of the Township of North Kawartha that granted application for three severances and one retained lot for the purpose of creating four lots on each of which 1559642 Ontario Inc. (the Applicants) propose to construct a permanent, year-round lakefront dwelling. Floor areas of the proposed dwellings range from 2,000 to 8,000ft^2 ….the proponents suggest the creation of four severed lots (with one retained), and two amendments (ZBA and OPA) are required to remove the infilling requirement. The subject lands are located within 120m of the Provincially Significant Fraser Wetland Complex (located to the north of the site) and are adjacent to the Provincially Significant Fairy Lake Island Wetland Complex located on Stony Lake and which abuts the shoreline of the subject lands."

Position of Parties: "Counsel Cork for the Appellants submitted that the Ministry of Natural Resources (MNR) "may have revised the boundaries of the Fairy Lake Island Wetland along the frontage of the subject property." He added that the Trent Severn Waterway seeks a 30-meter, shoreline buffer strip across the entire shoreline of the subject lands to protect the adjacent Wetland. The Applicants agreed that this should be a condition of the Board's order for provisional consent to be given."

Government Agencies: "As stated earlier, the County wanted the MNR to become involved in the subject property by conducting a peer review through the One Window planning protocol. Planner Mudd wrote to the MNR in August 2004 (Exhibit 2, Tab 5) requesting that the Ministry peer review of the Niblett EIA. In September 2004, the MNR replied that it could not get involved unless formally requested to do so by the MMAH through the One Window protocol (Tab 7). Planner Mudd then wrote to the Ministry of Municipal Affairs and Housing (MMAH) (Tab 8) to request that it authorize the MNR to proceed with a review of the Niblett EIA on the proposed severance. The MMAH responded to Planner Mudd's request in November 2004 (Tab 10) that the Ministry was not prepared to have the MNR get involved in the file. As noted, the independent consulting firm of Trow Associates Inc. was contacted (Tab 11) and the peer review was undertaken. That peer review agreed with the findings of the Niblett EIA, provided that mitigating factors were implemented (Tabs 12 and 13)… The Board dismisses Counsel Cork's characterization of the County's letter at Exhibit 2, Tab 7 as an expression of the County's uncertainty as to the wetland boundaries. In the Board's view, there was nothing persuasive before Counsel Cork for him to make such an assumption and Planner Mudd rejected his suggestion, and on whose evidence the Board places great weight and on whose evidence it relies. Further, the MMAH's decision not to involve the MNR; the MNR's responses to abide by the One Window planning protocol; and the County's acceptance of the MMAH's recommendation to engage an outside environmental consultant to conduct the peer review are persuasive evidence that both Ministries and the County considered the wetland boundaries to be correct."

Notes: "The Board places significant weight on the expert land use planning evidence

and opinion of Planner Mudd and accepts his uncontradicted evidence that this proposed development as reflected in the Zoning By-law Amendment and the Official Plan Amendment represents good planning. As the only Planner to testify in this case, his evidence carried the most weight in respect of the planning process and the Board accepts his recommendation to give provisional consent for the severance and to dismiss the appeals."

Landscape Connectivity Policies and Legislation: PPS 1997, PPS 2005
"The Niblett EIA as submitted and completed under the One Window Approach has assisted the Board in arriving at its determination that the proposed development complies with the PPS and the other relevant planning documents regarding issues and impact before it. The Board heard nothing persuasive in the cross examination of Messrs. Niblett and Ellingwood that would enable it to conclude that they have not suggested mitigating measures that are inappropriate in the case at hand. Regarding the PPS, the evidence is quite clear in the Board's determination – the nature of the proposed development is such that there are no demonstrated impacts on natural features or ecological impacts."

Decision, Interpretation and Application of Landscape Connectivity Policies:
Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL040880
Decision Number: 0247 **Issue Date:** January 24, 2006
Board Member(s): R.Rossi
Landscape Connectivity Terms: "valley corridor", "stream corridor", "ecological corridor", "landscape connectivity", "Significant Valley Corridor", "connectivity", "fragmentation of habitat for area sensitive species", "physical connections",
Overview: This case involved a proposal to develop seven single residential homes in the City of Etobicoke.
Position of Parties:
Government Agencies: Toronto Region Conservation Authority
Notes:
"The remaining issues in contention are environmental; some of which relate to impacts of this residential development proposal on the immediate and future health of the West Humber River Valley; the trees; flora; fauna; and habitat. Also important in the Board's view, in relation to the policy context, is how this proposal can stand and co-exist with the protection of the valley system in this vicinity."
"In his submissions, Counsel Wigley for the TRCA was critical of Dr. Coleman's approach to studying the subject lands and surrounding area. Counsel Wigley referred to the TRCA letter dated 25 November 2004 that commented that the Applicant's flora list contained only 22 species, to which Dr. Coleman had responded in his 12 January 2005 memorandum that his flora list was only for the subject site and did not include species located within the adjacent natural areas. This is further illustrated by the fact that the Applicant's fauna inventory found only eight bird species. The subsequent inventory work by TRCA for the valleys and the tableland found 24 bird species including the Eastern Screech Owl and the Hairy Woodpecker. Counsel Wigley submitted that the Applicant had not found either the owl or the woodpecker because their witness, Dr. Coleman had not looked at the valley. Counsel Wigley argued that these facts showed how the Applicant did not put the ecological function of the subject site in context with the larger surrounding ecosystem. He submitted that a true ecosystem approach to planning comprehensively assesses the functions of the larger ecosystem and insures that any proposed development is considered, located and designed to protect and restore these functions. The proposed development does not do this. The Board found Counsel Wigley's arguments in this regard to be highly persuasive and prefers his characterization of the Applicant's witnesses approach as evidence that the City's and TRCA's witnesses' evidence in these matters must be relied on by the Board instead."

"Witness Heuchert also referenced the evidence of Noah Gaetz – that the proposed excavation and regrading would destroy or injure significant valley vegetation as well as result in future negative impacts to existing and proposed vegetation due to the presence of vehicles, human and domestic pet intrusions, snow plowing and dumping. These impacts associated with the loss of valuable natural heritage habitat, in our opinion, cannot be fully mitigated. The cumulative impacts negatively impact the function of the ecological corridor and as such, the 'conservation of land,' as per the Conservation Authorities Act as implemented by Ontario Regulation 158. He advised the Board that the Ontario Court of Justice has previously upheld the Conservation Authority's ability to consider "the conservation of an ecosystem" as comprehended in the words "conservation of land" when approving or refusing a permit application under Ontario Regulation 158 (in *611428 Ontario Limited* v. *Metropolitan Toronto and Region Conservation Authority*, April 22, 1996)."

Landscape Connectivity Policies and Legislation: “
Witness Dale Leadbeater is a biologist who prepared the Natural Heritage Impact Assessment of the subject lands. She assessed the existing condition of the vegetative community, the flora, wildlife and landscape connectivity and impacts of the proposed development in respect of the loss of vegetation at the top of bank and the ravine slope; the loss of rare or uncommon tree species; the loss of tree canopy; fragmentation of habitat for area sensitive species; and the potential degradation of valley slopes and vegetation as a result of resident use of the valley slopes.
The Board adopts the evidence of Witness Leadbeater as persuasive and the most authoritative in respect of the research, findings and conclusions arrived at in the NHIA. The Board prefers this witness’s methodological approach and substantive evidence to those of Witness Coleman.

As she noted, there were no less than seven policies that applied to the management of natural heritage on the subject lands that indicate that the land contributes important and valued functions in respect of the features and functions both on the property and in the greater landscape context. She opined that Dr. Coleman had failed to identify these features and had not identified the appropriate mitigation to minimize those effects. It was thus insufficient, given the policy framework, to simply provide an opinion that was unsupported by documentation and consultation with the affected agencies. Her evidence on landscape connectivity and the ‘Significant Valley Corridor’ in the context of the PPS in the witness statement (Exhibit 57 p.3 [policy] and p.5 [impact]) was especially persuasive as referenced to the VSCMP policy, the PPS, the Metropolitan Toronto Official Plan (1994) and the Etobicoke Official Plan. The Board also accepted her ‘Reply to Reply Witness Statement’ (Exhibit 58) that the Applicant’s consultants‘ had taken her comments on connectivity out of context. The Board preferred witness Leadbeater’s evident that the proposed development would create ecological impacts and that those impacts could be considered as ‘significant’ within the planning context.

Decision, Interpretation and Application of Landscape Connectivity Policies:
Board Member Rossi dismissed the appeals. Landscape connectivity was listed as one of the reasons.

OMB File Number(s): PL050752
Decision Number: 1242 **Issue Date:** April 27, 2006
Board Member(s): R. Rossi
Landscape Connectivity Terms: "valley and stream corridor"
Overview: This case involved a proposal for a housing development.
Position of Parties:
Government Agencies: Toronto Region Conservation Authority
Notes:
Landscape Connectivity Policies and Legislation: n/a
Decision, Interpretation and Application of Landscape Connectivity Policies: The Official Plan Amendment and the zoning by-law amendment were approved. Landscape connectivity was not a factor in the decision.

OMB File Number(s): PL031169
Decision Number: 1488 **Issue Date:** May 18, 2006
Board Member(s): N.C. Jackson and G.C. O'Connor
Landscape Connectivity Terms: "ecosystem linkages", "significant linkage", "Natural Open Space Corridor", "natural corridor", "key migration corridors", "corridor" "migratory bird corridor", "connections"
Overview: The Appellant, Palm Place Development Inc., has applied to amend the Town of Oakville Official Plan and to rezone a parcel of land situated, north of the shore of Lake Ontario, on the south side of Lakeshore Road West between Great Lakes Boulevard to the east, and Burloak Drive to the west, near the boundary with the City of Burlington. At issue is the greening of the Town of Oakville and in particular, waterfront, with important environmental considerations including wildlife habitat for migratory land birds. Also at issue on the other hand, is the validity of the existing Official Plan policies specifically the designation on the east half of the Palm Place property of Private Open Space.
Position of Parties: "The current proposal is for 370 dwelling units in three separate towers with 12 storeys on the waterside stepping down to 7 storeys on the Lakeshore Road West side of the site. The proposal now includes the locating of the three towers on the westerly half of the site. The easterly half of the site is to be conveyed to the Town of Oakville, or other public body for public purposes. The Appellant has made the offer to convey the easterly half for nominal consideration as part of the planning process, but contingent upon the approval to construct 370 units on the west half of the site.
The Town of Oakville opposes the appeals but confirms that residential development is appropriate up to 27 dwelling units. The Town has considered possible acquisition or expropriation of the Shell House Lands. The Bronte Village Ratepayers' Association opposes the development based upon the impact on the surrounding residential neighbourhood. The Association, like the Town, supports the development of the subject property in the form of Low Density Residential for up to 27 units. The primary intent of the Association has been the acquisition of the Shell House Lands for a public park use. The Halton Region Conservation Authority opposes the development based upon migratory bird habitat. The Conservation Authority, originally a party, sought a change at the commencement of the hearing to part-time party status. This was approved. The Region of Halton, originally a party, has by correspondence withdrawn from the hearing."
Government Agencies: Halton Region Conservation Authority
Notes: Interesting discussion of who is qualified to testify before the Board:
"The Board, after having listened to submissions and the answers given by Ms Barrett as to her qualifications and experience, will qualify her to give opinion evidence as an ecologist. The Board considers an ecologist as one who has regard for the relationship of all natural life including birds, mammals and reptiles with the environment and each other. The Board considers Ms Barrett qualified to give opinion evidence respecting such matters including birds. She did not claim a specialty with respect to birds only. The Board finds it inappropriate to provide the negative requested by counsel, where the positive was not claimed. As an ecologist, she is a generalist with some knowledge and experience with respect to birding. This entitles her to give the Board the benefit of her knowledge including her opinion. The Board will decline the request to note that she has no specialty in birds. The rider sought is to some degree inconsistent with the term "ecologist", when no specialty in birds as an ornithologist was sought in the first place…The Board agrees with Mr. Kovacevic that in the case of *Rice* v. *Sockett* 8

D.L.R. 84 Ontario Divisional Court 1912, those giving opinion evidence do so on the basis of being possessed of special knowledge or skill upon which the expert is called to testify. The particular knowledge may be by way of study or experience. In this case, it is clear to the Board that the witness Barrett should be entitled to testify and give opinion evidence to this Board as an ecologist, by virtue of her education and experience."

Mr. Taylor confirmed that the Authority is still interested in the role of the subject property as a stopover for migratory birds and the nature of the subject property as a natural wildlife habitat. He confirmed the undertaking of a study in the spring of 2005. In the view of the Authority, the subject property, in conjunction with other parks to the north: Shell Park, Burloak Woods and Bronte Woods, do serve to meet criteria as Significant Wildlife Habitat. Mr. Taylor stated that the conveyance of the east half of the property to a public authority could compensate for the habitat loss on the west side, which is proposed for development. The remaining concern of the Conservation Authority is the 12-storey proposed height and the possibility of bird collisions or strikes. The Authority proposes a maximum height of approximately 25 metres or 8 storeys to equate with the existing tree line.

Landscape Connectivity Policies and Legislation: PPS 1997, PPS 2005, SWHTG
"Mr. Sandilands reviewed the definition of Natural Wildlife Habitat in the Provincial Policy Statement (PPS, 1997) in effect for this application. He then reviewed the four categories of Significant Wildlife Habitat as set out In the Natural Heritage Manual of the Ministry of Natural Resources. It was Mr. Sandilands' opinion that development could be permitted in a Significant Wildlife Habitat if there were no negative impacts. Negative impacts, in Mr. Sandilands' opinion of the PPS, mean the loss of natural features or ecological function for which an area is identified. Mr. Sandilands' opinion was that the loss of that significant feature would mean that it would no longer continue to exist. Since the habitat is lost and resulting activities would not permit it to continue to reside in or utilize the subject area, loss is not the same as reduction. Mr. Sandilands referred to an Ontario Municipal Board Decision by R. Boxma in *Aurora (Town) Zoning By-law 2213-78 et al* [2001] O.M.B.D. No.752.
Mr. Sandilands concluded that the lands proposed for development at Palm Place do not qualify as Significant Wildlife Habitat. In arriving at this conclusion he referred to the Significant Wildlife Habitat Technical Guide, the 2005 Migration Study and other bird counts as comparisons. It was his view that the first four criteria for evaluation of Significant Wildlife Habitat: relative importance of the site, presence of species of conservation of concern, species diversity and abundance were not met."
In contrast: "(Ms. Barrett's) concluding evaluation of Palm Place differed from Mr. Sandilands' in that she opined that Palm Place was an equal contributor to habitat for migrant birds with Bronte Park and Shell Park, and met criteria for designation for Significant Wildlife Habitat. She admitted that there was no other study in Town of Oakville to compare other Significant Wildlife Habitat with. Nonetheless, she felt she had supplied sufficient information to warrant finding of a Significant Wildlife Habitat. Ms Barrett referenced the National Heritage Manual and the statement that there could be gaps that warranted the identification of Significant Wildlife Habitat even after other natural areas had already been identified. She took the Board to Appendix Q of the Significant Wildlife Habitat Technical Guide (Exhibit 53, Page. 993) to determine whether Palm Place as evaluated could meet the criteria of that document. It was her opinion that meeting any of the eight criteria could warrant such designation. She differed from Mr. Sandilands on his use of the document and opined that all eight criteria were met as follows (see pdf for details)…

In determining whether there can be development in an area of Significant Wildlife Habitat, she opined that the Provincial Policy Statement would not have been given sufficient regard with the development as proposed since there would be degrading of that habitat so that it would no longer be significant. She referenced the loss of vegetation where the building was proposed as well as a loss of vertical habitat. There would be increased levels of disturbance from people, cars and pets as being predators. The proposed buildings at 12-storeys would prove to be an obstruction of the view for birds to Shell Park, a physical barrier to bird movement and a collision course for the birds."

Derek Coleman, on behalf of Appellant,: "It was his concluding opinion that in respect of the environmental issues of tree removal and migratory bird considerations that Palm Place was not a Significant Wildlife Habitat, was not of significant linkage, did not result in the loss of current ecological function and that therefore the application appealed to this Board conformed and had regard for the Provincial Policy Statement, the Halton Regional Plan and the Town of Oakville Official Plan."

And from the HRCA:

"Michelle Yvonne Cizmar of the Halton Conservation Authority was qualified to give opinion evidence in the area of environmental planning. Her evidence was that the Halton Conservation Authority performed a consultative role for wildlife habitat with advice given to municipalities who make the final decision on designations. She reviewed in some detail the planning process and the environmental considerations. In her view, storm water issues and shoreline protection issues had been resolved and migratory birds remained the main issue. She reviewed the relationship of Palm Place to Burloak Woods, Bronte Woods, Sheldon Creek Valley, Shell Park, Little Shell Park and described their relationship as a network which qualified as a Significant Wildlife Habitat. In her opinion, the proposed development will have negative impact on the loss of habitat, particularly height. Without mitigation, the development, in her opinion, does not have sufficient regard for the 1997 Provincial Policy Statement, is not consistent with the 2005 Provincial Policy Statement and does not conform to goals and objectives of the Town of Oakville Official Plan with regards to the natural environment. In her opinion, limited development can take place subject to modifications."

"The Board does agree with the Coleman testimony to the point that the Ontario Natural Heritage Manual provides that the identification and evaluation of Significant Wildlife Habitat is a local Planning Authority responsibility. The test under the Provincial Policy Statement is not only with Provincially Significant Wildlife Habitat but also Significant Wildlife Habitat in the local planning context of the Town of Oakville.

The Board finds the Palm Place site meets substantially the criteria from Schedule Q, Significant Wildlife Technical Guide (Exhibit 53, Page 27). In the Board's view, all criteria were met as set out in the Barrett testimony, accepted by the Board. Although the Significant Wildlife Habitat Technical Guide of the Ministry of Natural Resources document does not specify the number of criteria required, it is important that a majority be met. The Board concludes from the observations of the study and the birding literature that Palm Place together with Shell Park, Sheldon Creek Valley and the Bronte and Burloak woodlots form a resting area in the form an Open Space network, as Significant Wildlife Stop Over Habitat for land migratory birds.

This conclusion however, does not mean that there will be no development. The Conservation Authority and Ms Barrett have correctly applied the tests in the Provincial Policy Statement that development and site alteration may be permitted in

Significant Wildlife Habitat if it has been demonstrated that there will be no negative impact on the natural features or ecological function for which the area is defined. This panel does not interpret this test to mean the necessary removal of the natural features or ecological functions. Rather, the evidence of Ms Barrett and the Conservation Authority planner, Cizmar, is that with the conveyance of the east half of the Palm Place property, with additional plantings on the east and west portions of the property and with architectural bird friendly designing (reflection and design) of the building, the development can proceed with a height up to eight storeys. The Board accepts this evidence in the sense that the number of migratory birds sighted at the site does not justify a designation as Provincially Significant Habitat in the manner of Point Pelee. There is however an important local planning function that can be satisfied in this case with the application of reasonable planning standards that have the proper regard for the Provincial Policy Statement."

Decision, Interpretation and Application of Landscape Connectivity Policies: The appeals to the Official Plan and Zoning By-Law are allowed in part but the final Order is withheld (pending completion of certain items).

"The development will have appropriate regard for the Provincial Policy Statement. In particular, the development as downsized will protect the environment and give the Provincial Policy Statement the regard it should have at the top of the planning hierarchy:

1. Development and land use patterns which may cause environmental or public health and safety concerns will be avoided (1997 PPS, Exhibit 31, Volume 6, Tab187, Page 2429).

2. Development and site alteration may be permitted in significant wildlife habitat if it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area is identified (1997 PPS, Exhibit 31, Volume6, Tab187, Page 2435).

3. The site plan is filed subsequent to the Official Plan and Zoning amendments so that the following 2005 PPS provision applies to

   "The Board also wishes to be reflective of the views of most of the planning witnesses and the public that the best use of this site is as a public park. In the time available before the Board's final Order is issued, now that numbers of units and the perimeters of the development are better known, the Board directs the Town of Oakville to consider whether the Town of Oakville will make a final offer to purchase or to expropriate all of the Palm Place property."

OMB File Number(s): PL051313
Decision Number: 1794 **Issue Date:** June 22, 2006
Board Member(s): E. Pendergrast
Landscape Connectivity Terms: "River Valley Connection", "ecological linkage", river valleys that…connect the Greenbelt to the Great Lakes", "greenway links", "
Overview: This case involved a proposal for severance and development of three lots backing onto Bronte Creek valley land. The primary issue before the Board was whether or not dedication of the entire 15-metre setback area should be required as a condition of severing the existing property, and, if not, what portion, if any, should be required to be dedicated and how should any non-dedicated land in the setback area be protected.
Position of Parties: "The Town and the Region, with the support of Conservation Halton, advocated dedication of the entire 15 metres east of staked or stable top-of-bank. The applicant's position was that a conservation easement was both a more desirable approach and also would allow for more reasonable development of the proposed three lots, including
the provision of a rear amenity space with a depth of approximately 7.5 metres per dwelling, notwithstanding that the proposed conservation easement would ensure that no development took place on that amenity space. The Region did not take a position on the number of severances, but the Town's position was that there should be only one severance in order to create only two lots. Thornwood's position was that there should be two severances and three lots."

Government Agencies: Conservation Halton
Notes:
"

> The reason given by Mr. Dragicevic for preferring an easement to dedication have primarily to do with maintaining private amenity space for each of the proposed dwellings. In this regard, the Board accepts as highly reasonable Ms De Vito's evidence that putting residents in charge of regulating their own backyards is a problematic way to ensure that the setback area will be appropriately renaturalized and protected, since the kind of protection sought by Conservation Halton is at odds with the way most people use their backyards. In addition, the Board was presented with no specific example by any witness of how a prohibition against structures or other development as a term of an easement had effectively protected a comparable buffer area on a privately owned lot.

Landcape Connectivity Policies and Legislation: PPS 2005, Greenbelt Plan
"In view of the date of application, the 2005 Provincial Policy Statement applies to the proposal. The property is also subject to the Greenbelt Plan, which identifies the Bronte Creek Valley as a River Valley Connection and Water. As set out in the Region's October 17, 2005 letter (Exhibit 2a, Tab 3), subsection 3.2.5, 2a) of the Greenbelt Plan is applicable to the property. As summarized in the Region's comments that subsection provides that, "in considering land use changes or redevelopments in or abutting an urban river valley, applications should strive for planning approaches that establish or increase the extent of width of vegetation protection zones in natural self-sustaining vegetation, especially in the most ecologically sensitive areas."

"In considering this matter, the Board has also been guided by Mr. Ketcheson's submissions in his closing arguments that there is no right to a severance, and that the

Board has the power to require dedication of the 15-metre setback area without compensation as a condition of giving a provisional consent to sever off either one or two lots, and, in particular, that a required dedication is consistent with certain criteria in subsection 51(24) of the *Planning Act*, including:

a) the effect of development of the proposed subdivision on matters of provincial interest as referred to in section 2;

c) whether the plan conforms to the official plan and adjacent plans of subdivision, if any; and

h) Conservation of natural resources and flood control.

Decision, Interpretation and Application of Landscape Connectivity Policies:
Appeals are allowed in part.
"In presenting its considerations and conclusion regarding this issue, the Board notes at the outset that the Bronte Creek valley is a major river valley and a significant natural feature, and is identified as such in the Greenbelt Plan and the Regional and Local Official Plans. As stated in the comments of Conservation Halton on the applications, "Bronte Creek provides an important ecological linkage between Bronte Creek Provincial Park and Lake Ontario. The (Greenbelt) Plan states that the river valleys that run through existing urban areas and connect the Greenbelt to the Great Lakes are a key component of the long-term health of the Natural System." (Tab 4, Exhibit 2a, page 51)**.** Given its significance, the question of how best to protect the valleyland adjacent to 256 Bronte Road and the 15-metre setback area intended to protect the stability of the valley slope and to buffer it from nearby development is clearly an important one.
Having considered the evidence presented, the Board is convinced that the preferred method of protecting the 15-metre setback area is to have the area dedicated to the Town so that it, together with the valleyland to the west that has already been dedicated, will be in public ownership."

OMB File Number(s): PL050556
Decision Number: 2206 **Issue Date**: August 3, 2006
Board Member(s): M.F.V. Eger
Landscape Connectivity Terms: "valley and stream corridor", "Natural Corridors", "Natural Linkages", "linkage or corridor function", "linkages for wildlife"
Overview: In December 2004, Camp Villas Corporation (Camp Villas) applied to amend the Official Plan for the Town of Caledon and the Town's Zoning By-law 87-250. The purpose of the applications was to redesignate and rezone to permit the development of a single detached dwelling on a new lot on lands currently designated as Environmental Policy Areas and zoned Hazard Lands.
Position of Parties: Camp Villas is of the position that it had a contractual agreement with the Town to look at the northeast area of Block 144 for future multi-lot residential development. Camp Villas modified its intent and filed for official plan and zoning by-law amendments for a single detached dwelling after the Greenbelt Act 2005 came into effect and created a moratorium on multi-lot developments. The Town of Caledon, the Toronto and Region Conservation Authority (TRCA) and local residents all oppose the applications and contend that the lands should not be developed on the basis on their environmental significance.
Government Agencies: Toronto and Region Conservation Authority (TRCA)
Notes: "The significant difference in position and evidence between the proponent and the public agencies was the perspective from which they examined the application. The proponent's witnesses focussed on the fact that the applications before the Board should be viewed as a minor development comprising only one additional residential lot. To a large extent, the assessment of the proposed development area and how it could be serviced was also from this perspective. On the other hand, the public agencies' approach was much more comprehensive and the evidence called supported the view that the subject portion of Block 144 is important, is part of and contributes to the environmental significance of the larger valley and woodland system. The Board finds that the evidence of the public agencies is to be preferred to that of Camp Villas' witnesses and flowing from that the applications to amend the official plan and zoning by-law should not be approved."
"Authority Staff also conducted a detailed review of Mr. Kaiser's EIS and concluded that there was not an adequate inventory of the larger woodland area. Other concerns were that the EIS specifically concentrated on the proposed development site, the fauna and wildlife inventories were not sufficient (too little data) and there was no data included for lands east of the unopened Mount Hope road allowance. Overall, their conclusion was that the analysis contained in the EIS was not adequate because it was focussed on the development of lands above the top of bank in isolation of an examination of the site's location and ecological contribution to the larger woodland and valley corridor."

Landcape Connectivity Policies and Legislation: PPS 1997, Greenbelt Plan, NHRM
"Mr. Gaetz is a biologist/ecologist with the TRCA. Based on a review of TRCA's databases, normally used for plan input and review purposes, he concluded overall that the subject corner of Block 144 is part of a larger and diverse woodland community and valley land system. More specifically, he emphasized that the Natural Heritage component of the *Provincial Policy Statement, 1997* recognizes the importance of remaining natural areas and their function as a single unit. Exhibits 22 and 23 show the subject area in the context of the larger woodland that is estimated at approximately 75 hectares and the Cold Creek which is a sub watershed of the Humber River. The

woodland area as identified by the TRCA extends to the rear of the homes on Egan Crescent. Using the Natural Heritage Reference Manual, this size of woodland within an urbanizing context represents a significant woodland. It is also his opinion that the valley system associated with the Humber River also functions as a large landscape feature providing linkages for wildlife."

Decision, Interpretation and Application of Landscape Connectivity Policies: The appeals are dismissed.

"All of Block 144, including the subject lands are currently designated Environmental Protection Area and zoned Hazard Lands. The subject applications propose to alter this designation and zoning for an area of about .27 hectare to permit one new residential lot. The onus in this case was on the applicant Camp Villas to clearly show that the lands are not Environmental Policy Area in character and function for the Board to find that it is appropriate to alter their current designation and zoning. Having reviewed all the evidence and as contained in these reasons, the Board finds that this onus has not been met and the approval of the applications would not result in good planning. The applications do not have sufficient regard for the Natural Heritage Component of the PPS, 1997, and do not conform to the Region of Peel and Town of Caledon official plan policies for the protection of significant environmental features and their over arching ecosystem approach to planning. The applications also run contrary to the longstanding Valley and Stream Corridor policies of the TRCA.

The Board was also asked by counsel for Camp Villas to apply another test – to give weight to the fact that if the Board allowed the appeals, the balance of Block 144 would go into public ownership. He indicated that because the remaining lands would be within the Natural Heritage System of the Protected Countryside in the Greenbelt Plan, there could be no further applications for development eliminating all concerns expressed by the parties and the residents regarding future applications and cumulative adverse environmental impacts. In its decision the Board has set out the scope of the applicable planning policy in this case. In addition, it should be noted that the area proposed for development by these applications is also within the Natural Heritage System of the *Greenbelt Plan* which adds to the view they are environmentally significant. At paragraph 106, *Material Handling* v. *Essex* [2002] OMBD No. 1133, the Member captured the essence of the Board's discretion in balancing established policy and individual appeals-

Establishing a policy implies that it should be followed fairly and equally unless there is some good and sufficient reason, arising out of the circumstances before the Board, to do otherwise. This marks the reasonable exercise of discretion.

The Board is not compelled by any of the circumstances of this case to exercise such discretion.

The Board orders that the appeals are dismissed."

OMB File Number(s): PL020446
Decision Number: 3289 **Issue Date:** November 23, 2006
Board Member(s): M.F.V. Eger and D.L. Gates
Landscape Connectivity Terms: "continuous corridor system", "regional scale corridor", "local scale connecting corridor", Richmond Hill Natural Corridor Study, "natural heritage system corridor", "Natural Linkage Areas", "nature and trail linkages", "east-west surface linkage",
Overview: This case involved a proposal before the Board to expand the urban boundary of the Town of Richmond Hill. ..
"Lands on the edge of development pose certain environmental challenges that are not present elsewhere. One such challenge is who should end up owning these large natural areas? A second challenge is how the natural areas shall be used. A final challenge is that if it is decided that these natural areas should ultimately come into public ownership, must landowners convey them without compensation or who should bear the cost? In so far as the Board concurs with all the evidence supporting public ownership of the natural areas, how will all these lands come into public ownership and who will bear the cost? The unfortunate truth of the matter is that not all of the natural areas will come into public ownership through the development process, or at least not at any time soon. This is because the Planning Act provisions clearly stipulate when such conveyances can be required as a condition of development approval (severance, subdivision, condominium) and in the Board's opinion, the Act never anticipated a situation where about one third of the development area would be sought to be transferred into public ownership.
Thus the conundrum for the Board became whether it should approve a plan for the urbanization of North Leslie that has as its foundation a NHS and Greenbelt system some of which may never come into public ownership."

Position of Parties: Generally, all witnesses supported the goal of public ownership of the NHS. Many reasons were given such as long-term stewardship and management of these important environmental lands.

Government Agencies: Toronto and Region Conservation Authority (TRCA), MMAH

Notes: "The Province's aggressiveness in enacting the *Oak Ridges Moraine Act, 2001* and the *Greenbelt Act, 2005* and their regulations appears to have substantially changed the positions of the parties such that many of the once disputed areas are now protected by one or other of these respective plans. This may also be the reason for SRVS's lack of presence at this hearing and the ability of the parties to settle many of the issues that were outstanding at the commencement of this hearing. It is unfortunate that some of these issues could not have been settled earlier."

"The North Leslie Secondary Plan is premised on the principle of "Environment First". Section 2.1 says –
This means that development will only be approved if it can be demonstrated that the natural heritage system and its functions have been protected and the integrity of the water resource system, both surface and ground water resources, have been protected. In order for the long-term sustainability of the Natural Heritage System, the ecological features and their functions must be protected, restored and enhanced through the development of this plan."

"During the ecological phase of the hearing, the landowner's evidence was given by Dr. Coleman on behalf of Belg; Mr. Sandilands on behalf of Manson; Mr. Charlton for Endean; Mr. Cunningham for Bawden-Wood; and Mr. Fraser for Mizrahi and Richmond Greenhouses. Mr. Sharp and Ms Lewis gave evidence on behalf of the public agencies. Mr. Varga, Mr. Heaton and Mr. Bazinet were summoned by SRVS. The Board finds that the extensive and current fieldwork and analysis undertaken by the owner's and public agencies' witnesses in establishing the proposed NHS is to be preferred over the SRVS witnesses.
For example, Mr. Varga's proposed seven additional local scale "connecting corridors" (Exhibit 80) as part of the proposed NHS. These included additional corridors between wetland features, additional forest cover as compensation for loss of woodlot area and filling in or rounding off of other features. In all cases, but for the Mizrahi property, the evidence of Ms Lewis, Mr. Sharp and Dr. Coleman rejected these recommended connections as unnecessary for the functioning of the NHS or not reflecting current field conditions. It was clear from the evidence that the SRVS' witnesses were not relying on the most up-to-date field work and analysis which had been given in evidence earlier in this hearing.

"The Board simply contrasts the policy recommended by the Ecologist's group with the evidence of Mr. Varga and Mr. Heaton. Mr. Varga had recommended a no development buffer of 120 metres around the nesting habitat in PSW34. But in cross-examination he admitted that there is no basis for such criteria in the 1997 PPS or the Natural Heritage Reference Manual. Mr. Heaton referenced a document entitled *MNR's Management Guideline for the Protection of Heronries in Ontario, 1984*, as the basis for recommending a 300 metre buffer. He also suggested a one-kilometre heavy development buffer zone during breeding season, mid-March to the first of August. This would impact more than half the North Leslie plan area. In cross-examination it was established that that document was applicable to forest management areas and not to an area like North Leslie.
Also, the Board finds that this opinion is just not reasonable given the colony has established and expanded in an area in close proximity to Highway 404 and Leslie Street.
Later in Mr. Heaton's cross-examination, it was agreed that the relevant document is a 2000 MNR document entitled the *Significant Wildlife Habitat Technical Guide*. This document identifies heron colonies of twenty-five nests or more as significant wildlife habitat within the meaning of the PPS, unless they are located on the Oak Ridges Moraine where fewer nests are considered significant. North Leslie has eighteen nests located south of the Moraine."

Landscape Connectivity Policies and Legislation: PPS 1997, Greenbelt Plan, ORMCP
"The Provincial Policy Statement, the Oak Ridges Moraine Conservation Plan, Greenbelt Plan and the Rouge North Management Plan (as set out in the Greenbelt Plan) apply to North Leslie as set out in this decision."
"Woodlands, wetlands and watercourses within the area of the Oak Ridges Moraine and identified in the Oak Ridges Moraine Conservation Plan as Key Natural Features or Natural Linkage Areas form part of the recommended NHS in North Leslie. As well the Greenbelt Plan includes a Natural Heritage System that includes those areas of the Protected Countryside with the highest concentration of the most sensitive and significant natural features and functions. The Greenbelt Plan recognizes the necessity of managing these natural features and functions in a comprehensive way. The North

Leslie Plan also incorporates the Greenbelt Plan's Natural Heritage System. The NHS and the Blended Plan not only incorporate these features but also the provincial policy that protects them.
The Board finds that the proposed Secondary Plan provides for the establishment of a NHS that appropriately recognizes all significant environmental lands and provides for a regional scale corridor connecting the ORM with the Rouge Watershed through the North Leslie lands as envisioned in provincial policy documents."

"It is clear through the drafting of the Oak Ridges Moraine and Greenbelt Acts, Amendments and Regulations and the evidence of Mr. Sit, a Planner with the Ministry of Municipal Affairs and Housing, that the Provincial Government did not intend to prohibit development on the North Leslie lands outside of the natural areas.

The Board accepts the evidence of Mr. Sit and the Town and other public agencies' positions that the Greenbelt Act should be given a broad and liberal interpretation as a whole and that the intention of this legislation is not to permit active parkland within the Protected Countryside of the Greenbelt. The Board concedes that the legislation could express this intention more clearly."

Decision, Interpretation and Application of Landscape Connectivity Policies: The appeals are allowed in part.
"The Provincial Policy Statement, the Oak Ridges Moraine Conservation Plan, Greenbelt Plan and the Rouge North Management Plan (as set out in the Greenbelt Plan) apply to North Leslie as set out in this decision. The Board is satisfied that the proposed amendments to the Region of York Official Plan and the Town of Richmond Hill Plan are comprehensive and, subject to the findings of the Board in this decision, are appropriate, have regard for and reflect the provincial policy context and represent good planning.
The Board will allow the appeals by Belg and E. Manson, in part. Further, the Board directs the parties to revise Exhibit 320 - the Regional Official Plan Amendment and Blended North Leslie Secondary Plan in accordance with the Board's Decision."

"In considering an OP for the last large greenfield parcel of land in Richmond Hill, the Board was looking for a grand vision. Largely through the policy direction of the Province, and the prodding of the Town and other public agencies, and the ultimate acceptance by the landowners, this grand vision was realized by anchoring the plan for North Leslie on a comprehensive natural heritage system. This system, consisting of approximately 30% of the land under review, includes many north-south nature and trail linkages centered on the three tributaries of the Rouge, the Greenbelt, provincially identified environmentally significant features and areas of scientific interest, the southerly edge of the Oak Ridges Moraine, and an east-west surface linkage through a pipeline easement. Both the landowners and the public agencies are to be congratulated for their spectacular yet sensitive vision for North Leslie."

Although the concept of ecological linkages was supported by this ruling, not all of the proposed linkages for the Natural Heritage System were deemed necessary. For example, recommendations by Save the Rouge Valley System Inc. for seven additional local scale "connecting corridors", which included corridors between wetland features, additional forest cover as compensation for loss of woodlot area and filling in or rounding off of other features, were rejected in all but one case "as unnecessary for the functioning of the NHS or not reflecting current field conditions".

The Board found that the proposed Secondary Plan "provides for the establishment of a NHS that appropriately recognizes all significant environmental lands and provides for a regional scale corridor connecting the ORM with the Rouge Watershed through the North Leslie lands as envisioned in provincial policy documents." This ruling supported the importance of ecological linkages and confirms that landscape connectivity is indeed present in Ontario's provincial policy and a planning consideration before the OMB.

OMB File Number(s): PL020603
Decision Number: 3379 **Issue Date:** December 4, 2006
Board Member(s): M.A.F. Stockton
Landscape Connectivity Terms: "wildlife corridors",
Overview: The case involved an appeal for a proposed Official Plan amendment for the Town of the Blue Mountains. The amendment would allow for a large resort development on a 620-hectare property. This is Phase II of the hearing, which dealt with "deferred lands" from Phase I.
Position of Parties: The Niagara Escarpment Commission (the "Commission" appeared in opposition to the approval of the Official Plan Amendment as it related to the deferred lands. Castle Glen Developments (the "Proponent"), the Town of Blue Mountains (the "Town"), and the County of Grey (the "County") all appeared in support of the Official Plan Amendment as it related to the deferred lands.
Government Agencies: Niagara Escarpment Commission
Notes: "Mr. Dougan was critical of the Stantec report in several respects. In the first place, he stated that the report lacked "integration" of the various natural heritage features on the site. By this he meant that there was no analysis of the interdependence of these features, and that therefore, there had not been an appropriate natural heritage systems approach. In particular he felt that sufficient regard had not been given to the significant habitat of the Hart's-Tongue fern, the butternut tree and the Golden Winged warbler. Furthermore, he felt that the loss of significant woodlands in the Proponents conceptual plan meant an unacceptable reduction in wildlife corridors."
Landscape Connectivity Policies and Legislation: PPS 1997, NEP
Decision, Interpretation and Application of Landscape Connectivity Policies: The appeal was allowed in part. The Board found that the Caste Glen Official Plan has regard for the PPS, conforms to the NEP and the OPs of the County of Grey and the Town of Blue Mountains, provides a policy framework for protecting natural heritage features and functions, and represents good planning in the public context.

OMB File Number(s): PL060214
Decision Number: 0449 **Issue Date:** February 20, 2007
Board Member(s): S.B. Campbell
Landscape Connectivity Terms: "Valley and Stream Corridor", "valley corridor", "wildlife movement corridor", "linkage improvements", "connectivity of habitat",
Overview: This case involved a development proposal to construct two condominium apartment buildings on a heavily treed residential lot located "in or adjacent to" a ravine.
Position of Parties: The City of Toronto opposed the proposal, largely due to concerns over its encroachment into the natural heritage area. A land use planner testifying on behalf of the TRCA stated that "the subject property is inappropriate for the proposed intensification as the construction impacts and additional permanent urban intrusion into the valley corridor will result in irreversible harm to the natural heritage system". Local residents were also in opposition.
Government Agencies: Toronto and Region Conservation Authority (TRCA)
Notes: "The most striking feature of the neighbourhood, however, is not manmade. Rather it is the vital, well-treed ravine feature running through the neighbourhood which must be protected through an appropriate application of the relevant planning documents."
The site contributes to the "area's function as a wildlife movement corridor and staging area for migrant and neotropical bird species".

"Mr. Heuchert testified that TRCA staff met on the site with representatives of the Appellant on December 13, 2004. The Appellant was informed that while the property was within a TRCA "Area of Interest", it was not regulated under the TRCA's Fill Regulation. Mr. Heuchert testified that the Appellant was told the property was entirely within the "valley system" and that the TRCA wanted to reduce new development from further encroaching into this system. The Appellant was told that the TRCA would comment during the planning process. Mr. Heuchert testified that the TRCA "did not comment on the application as a satisfactory Natural Heritage Impact Study was not provided". With all due respect, the Board must comment that such a position is ridiculous. One would imagine that if a NHIS is inadequate, that is more reason for the TRCA to provide comments."
"The fact that the TRCA did not remain involved in the consultation process on these applications, provided little direction during the process, and appeared at the "eleventh hour" as a participant, not a fully engaged party, in this hearing causes the Board to question its interest in protecting the ravine from the depredations of development. If a natural heritage feature is deserving of the TRCA's attention, it is deserving of that attention earlier, rather than later in the process. For the public review process to work effectively and efficiently, public agencies like the TRCA must provide comment on applications in a timely fashion."
It was the evidence of Mr. Ferris, the Appellant's landscape architect, that after the final NHIS was filed with the City in September 2005, no comments were received on the document until immediately prior to the commencement of this hearing. The Board must reiterate the comments it made on the TRCA's participation in this matter; if a natural heritage resource is significant, if it deserves protection, the City must participate in the consultation process in a timely manner. No one gains anything if the Appellant is left in the dark about the City's reservations about a seminal issue until the eve of a hearing. Mr. Ferris testified that the City's forestry and ravine staff usually provide comments on reports, facilitating discussions on solving problems."

Landscape Connectivity Policies and Legislation:
"Part 2.3 of the PPS provides that natural heritage features and areas are to be protected from incompatible development. For the reasons set out above, the Board finds that the subject is located adjacent to a valuable natural heritage feature, the Nordheimer Ravine. The subject property is not located in any of the significant valleylands, wildlife habitat or woodlands for the purposes of the PPS. The Board finds, having regard to the Appellant's NHIS and companion documents that the proposal has regard for the ravine feature and suitable mitigation measures will be taken."
Decision, Interpretation and Application of Landscape Connectivity Policies: "The Board finds that the proposal satisfies the objectives of the PPS, MetroPlan, the in force OP and the New OP. As such, the proposal constitutes good planning as it fits the varied residential pattern of the neighbourhood and it can be developed in a manner not adversely impacting the adjacent ravine. The Board allows the appeals and approves the OPA found in Exhibit #2, TAB 45 (Attachment #1) and the ZBLA found in Exhibit #2, TAB 46 (Attachment #2)."

OMB File Number(s): PL051147
Decision Number: 1411 **Issue Date:** May 17, 2007
Board Member(s): J. de P. Seaborn
Landscape Connectivity Terms: "landscape connectivity", "Valley and Stream Corridor Management Plan", "corridor and linkage function of the valley walls", "connectivity between river and creek systems", "natural connections", "connectivity", "large habitat block that connects two ESAs", "connection", "linkage functions"
Overview: This case involved a an Official Plan Amendment, a Zoning By-law Amendment and a proposed plan of subdivision in connection with a proposal to develop a vacant parcel of land situated in the west end of the Town of Ajax (Town) with 29 residential estate lots.
Position of Parties: The Town and the Toronto Region Conservation Authority (TRCA) are opposed to development of the site and take the position that it should be preserved and designated under the Town's Official Plan (Town's OP) as Environmental Protection.
Government Agencies: Toronto Region Conservation Authority (TRCA)
Notes: "The TRCA position was that an integrated approach to ecological and environmental issues must be taken when analysing the site's characteristics. The tablelands and valleylands should not be viewed as discrete pieces of land, capable of separation. The site as a whole provides value given the significant forest cover and habitat for rare/endangered species, regionally rare species, species of concern, and connectivity between river/creek systems to the south and north. The TRCA also indicated that any development would jeopardize the viability of the portion of the site designated as EP and in any event generally reduce the amount of greenland and natural heritage systems in an area that has already experienced significant loss due to urban development."
"The TRCA also argued that development of the site would be a dangerous precedent for the development of other remnant tableland parcels within its jurisdiction. Viewing the site in discrete pieces is contrary to an ecosystem approach. In short, while the landowner may wish to develop it should not be permitted to do so as the result is further urbanization of the valley and green space system."
Landscape Connectivity Policies and Legislation: A variety of planning policies were relied upon by the parties including the Provincial Policy Statement (PPS), Durham Official Plan (Region's OP), the Town's OP and policies of the TRCA, in particular the Valley and Stream Corridor Management Plan (VSCMP).
"However, Jizoco's experts did agree that of particular relevance is Policy 2.3.3, which provides that the diversity of natural features in an area and the natural connections between them should be maintained and improved where possible. In considering then the extent to which there should be development at the site, the Board is required to consider the policies contained in the PPS, irrespective of whether the site has been identified as a provincially prominent site under a particular policy, legislation or regulation."

Decision, Interpretation and Application of Landscape Connectivity Policies:
Based on the totality of the environmental evidence and with a view to considering the policies at both the provincial and municipal levels that espouse the need for balancing protection with development, the Board concludes that the third plateau (closest to Urfe Creek) is not appropriate for residential development and should accordingly form part of the EP designation proposed for Urfe Creek... In arriving at this conclusion, the Board has considered the impact assessment undertaken by Jizoco and balanced this

assessment against the opinions of experts from the TRCA and those retained by the Town. Development of the third plateau has the greatest potential to affect corridor and linkage functions of the valley walls and floodplain of Urfe Creek. In this regard, the Board accepts that Urfe Creek represents a large habitat block that connects two Environmentally Significant Areas to the south and the north. The introduction of residential houses on the third plateau, in such close proximity to the Urfe Creek and its associated valleylands, has the potential to compromise this connectivity. Moreover, maintaining the third plateau in its natural state will assist in the goals of the TRCA to maintain forest patch and habitat for all species, regardless of their classification.

OMB File Number(s): PL03132
Decision Number: 0724 **Issue Date:** March 21, 2007
Board Member(s): M.C. Denhez
Appeal: Pro-Natural Heritage
Landscape Connectivity Terms: "connectivity", "hydrogeological connection", "habitat connection", "natural linkages",
Natural Heritage Issue(s): Adjacent lands (to natural heritage features)
Overview: The Greenspace Alliance of Canada's Capital (GACC) wants the Board to introduce a provision to the City Of Ottawa's new Official Plan (OP) that would require an Environmental Impact Study (EIS) for development within 30 metres of an Rural Natural Feature (RNF). RNFS are defined in the draft OP as "natural areas in the rural area that contain woodlands, wetlands, and wildlife habitat that were identified by the Natural Environment Systems Strategy as significant in the context of the City of Ottawa". The mapping of the RNFs does not follow the outlines of the physical feature, but instead the legal property line. This means that in some cases the lands designated RNF extend beyond the actual physical boundary of the natural heritage feature, and in some cases the natural heritage feature extends beyond the lands designated RNF and are thus unprotected. While an EIS is required for development within 30 metres of a Natural Environment Area (NEA) or Provincially Significant Wetland (PSW), no such requirement exists for development within 30 metres of RNFs. The GACC appealed OP Section 3.2.4, "to insert the same requiremnt for an EIS, for development within 30 metres of an RNF, as there is for development near a wetland or NEA".
Position of Parties: The City of Ottawa objected to the proposed change to the OP. The City argued that most natural features already include a built-in buffer (i.e. from the edge of the physical feature to the property line). They also argued that the correct way to address potential effects, from projects on adjacent lands, was via the "generic residual" environmental provisions of the OP rather than via a 30 metre buffer. These generic residual provisions apply to all properties and even lands with no environmental designation may require environmental studies concerning vegetative cover, erosion prevention, protection of endangered species, and consideration of the sub-watershed.
The City and the Ottawa-Carleton Home Builders Association (OCHBA) argued that the assessment of proposed development adjacent to an RNF would be "operationalized at the pre-consultation level", meaning that a collection of studies would be triggered when a development application was being prepared.
Government Agencies: n/a
Notes: The City of Ottawa objected to the proposed change to the OP but did not dispute the "underlying principal that development near environmental assets should be scrutinized" and agreed that "only a small percentage of the City's land mass had been studied in depth, so identification of environmental assets was a work in progress".
Landscape Connectivity Policies and Legislation: The Board referred to both the 1997 and 2005 PPS for "parameters and comparisons" on the issue of adjacent lands. As stated by the Board, "the principle and importance of adjacency are in Provincial policy". The Board notes the importance of adjacent lands to "ecological diversity and connectivity" and notes the repeated emphasis of the PPS 2005 on "ecological functions". The Board finds that "adjacency is a significant issue under the PPS, and thus deserves to be a significant issue under the OP. The test, as articulated in the 2005 PPS and useful for the purposes of good planning, is for: the ecological function of the adjacent lands (to be) evaluated and (for it to be) demonstrated that there will be no negative impacts on the natural features or on their ecological functions".

OMB File Number(s): PL060548
Decision Number: 2536 **Issue Date:** September 17, 2007
Board Member(s): D.R. Granger
Landscape Connectivity Terms: "landscape connectivity", "connectivity of ecological function", "landscape connection", "linkage", "natural swale area linkage", "potential to be rehabilitated as a linkage", "natural features that are continuous, linked and significantly close to allow for movement of flora and fauna throughout the area", "crossing of agricultural lands by some wildlife"
Overview: This hearing addresses remaining appeals related to the Blair/Bechtel/Crickston Environmentally Sensitive Landscape (BBCESL) designation, as set out in a decision of the Region of Waterloo (Region) that approved proposed Amendment No. 22 (ROPPA 22) to the Regional Official Policies Plan (ROPP). The hearing of the appeals will focus on the appropriateness of these lands being included within said designation.

Position of Parties: "The land use planner for the Region is of the opinion that ROPPA 22 is consistent with the PPS, noting the importance of natural features being protected for the long term and the maintaining, restoring or where possible, improving diversity and connectivity of ecological function and biodiversity of natural heritage systems for the long term as set out in PPS policies 2.1.1 and 2.1.2. His evidence and opinion regarding the PPS was not contradicted by any other evidence.
The planner for the appellants maintains that the boundary of the BBCESL can be retracted to exclude the agricultural lands of the appellants. He noted that these lands are already protected by the agricultural designations restricting the uses to primarily agricultural. He confirmed his relying on the evidence of the ecology/natural heritage expert of the appellants with respect to the appropriateness of any boundary retraction. It is his opinion that it is unfair to prejudge today what might potentially be appropriate in 20 or 30 years, including the possibility of urban expansion of the Blair settlement area onto the subject lands."
Government Agencies: n/a
Notes: "ROPPA 22 represents an advanced planning approach to recognizing, maintaining or improving landscape connectivity and ecological functions in areas of the region noted for their concentrations of high quality natural areas in this case areas focusing on the Laurel Creek headwaters and the Blair-Bechtel-Crickston Creek areas. These two areas generally coincide with non-prime agricultural lands that could be looked at as having potential for urban expansion or other limited non-farm related rural uses in the future. In order to address the possible conflict between non-farm related uses and environmentally sensitive uses, the Region has set out to identify and protect those areas of concentration of high quality natural areas for long-term protection from any development other than continued agriculture.
This general principle as confirmed in ROPPA 22 is not in dispute and, as now in effect, represents an environmental step forward in the protection of important overall natural landscapes, as opposed to separate islands of natural areas, that can include cultural uses such as farming or even areas of human settlement as in this case including the village area of Blair, acknowledged to be the earliest inland settlement in Ontario. ROPPA 22 represents an added level of long-term protection and finality of land use."

Landscape Connectivity Policies and Legislation: PPS 2005
"Having considered all of the evidence presented, the Board finds that the inclusion of

the lands of the appellants in the BBCESL is consistent with the PPS, conforms to the in-force policy 4.6.2 of ROPPA 22, is appropriate, represents good planning and is in the overall public interest of the community."

Decision, Interpretation and Application of Landscape Connectivity Policies:
Appeals are dismissed.
"The Board is satisfied that the boundary of the BBCESL is most appropriate with the inclusion of the subject lands. To exclude the lands and leave open the prospect of future development potential could result in a significant narrowing of the landscape connection between the natural lands identified to the west with the natural lands identified to the east and less prospect of the potential to improve and expand the natural swale area linkage along the north boundary of the subject lands.
The Board is cognizant that the BBCESL represents a landscape protection and not one individual natural feature. As a landscape feature, cultural activities, including the existing farm use of the subject land is anticipated to continue, albeit with the hope of greater stewardship in an effort to afford better protection for the natural environment. While land use is being further restricted over the long-term planning period of the regional official policies plan, the existing agricultural use will continue as a legally permitted use. All parties acknowledge the right to make applications for change pursuant to the *Planning Act* in the future.
In conclusion, the appeals by Peter Glaser, Guenter Lotzmann and Martin Gedja are dismissed and Amendment No. 22 to the Regional Official Policies Plan is approved as adopted by Waterloo Region.

OMB File Number(s): PL040791
Decision Number: 2682 **Issue Date:** October 10, 2007
Board Member(s): R. Rossi
Landscape Connectivity Terms: "physical and ecological limits of the corridor", "contiguous valley corridor", "corridor", Thames Valley corridor,
Overview: This case involved an appeal of a decision of the County of Middlesex to designate the Appelants' lands as Protection Area under the new Thames Centre Official Plan and the new Zoning By-law 75-2006.
Position of Parties: The Planner for the Municipality of Thames Centre identified the Thames River Valley where these lands are situated as the town's most significant natural feature and protecting it is within the public interest. He submitted that the subject lands should remain in their natural state. The County of Middlesex endorsed the Municipality's position.
Government Agencies: Upper Thames River Conservation Authority (UTRCA)
Notes: "Allowing further development in the Thames River Corridor does not represent good planning as this interferes with the movement of animal species that are dependent on their corridors for their life functions. Their proposed Official Plan Amendment is not good and does not have regard for the PPS and would create problems for conforming to the County Official Plan. Mr. Seddon also noted that no studies had yet been completed so there are unknown variables."
"The Thames River Valley is the Township's most significant natural heritage feature. Retaining the valley in its natural state and improving its natural and scenic quality and the ecological functions and features within and associated with the Valley is considered to be in the public interest. The Township will consult…to identify both the physical and ecological limits of the corridor to ensure that lands within the Valley and associated ecologically with the Valley, with the exception of lands already developed, designated and/or zoned for development, remain in a natural state and that other lands and land uses do not adversely impact the Valley or its associated ecological functions and features."
"Mr. Brick said Mr. Skinner's lands have a slope hazard by virtue of its position along the Thames River. He told the Board that this slope hazard is a complex one with an upper slope, a bench, a lower slope, another bench and then a riverbank. There is a contiguous valley corridor with some open spots and a road that comes to the property. For other lots created in these areas, the UTRCA is able to deal with site-specific issues but it is difficult to deal with this cumulatively from a natural heritage perspective. He noted that this corridor has a carrying capacity but he wondered aloud how many incursions can be allowed here before one starts to interrupt the natural valley activities. Where zoning permits development, the UTRCA would suggest that the municipality require site-specific EISs for each location, but in cases where development came along and the applicant proposed to add significant new area to the corridor (like the conversion of agriculture land to rural residential – that is, the creation of numerous lots), this should be subject to a comprehensive EIS in order to determine whether the corridor could sustain the introduction of any more cultural incursions."
Landscape Connectivity Policies and Legislation:
PPS 1997, PPS 2005
Decision, Interpretation and Application of Landscape Connectivity Policies: "The only public interest here is to ensure that the natural heritage of the corridor is not violated and that no building takes place in an area subject to natural hazards. The Board notes that these concerns are addressed appropriately by UTRCA Regulation

157-06 with responsibility falling to the Conservation Authority to ensure such protection. The Board finds the UTRCA's determination in that regard is both sufficient and appropriate when considering the appropriateness of permit issuance to the Appellants for the subject lands – something this provincial body has already done under the previous planning regime. Accordingly, having considered all of the evidence, the Board allows the appeals;

OMB File Number(s): PL040298
Decision Number: n/a **Issue Date:** December 4, 2007
Board Member(s): D.R. Granger
Landscape Connectivity Terms: "land fragmentation"
Overview: This is an appeal of a lot severance.
Position of Parties: The County of Oxford is appealing the County Land Division Committee's decision to grant an application by William Kloepfer to sever part of a lot. The lot is designated as environmental protection in the County OP. The UTCA also opposes the consent to severance.
Government Agencies: Upper Thames Conservation Authority (UTCA)
Notes:
Landscape Connectivity Policies and Legislation: PPS 1997
Decision, Interpretation and Application of Landscape Connectivity Policies: The Board allowed the appeal. The Board concluded that the proposed lot did not have proper regard for the PPS, did not conform to the OP and did not represent good planning.
"While the applicant may build a home for his sons somewhere on this property, he cannot be the cause of further land fragmentation by the creation of a new non-farm rural residential lot in this important prime agricultural area."

OMB File Number(s): PL051140
Decision Number: n/a **Issue Date:** December 7, 2007
Board Member(s): K.J. Hussey
Landscape Connectivity Terms: "wildlife corridors", "corridor's ecological function", "unconnected with the rest of their lands"
Overview:
Position of Parties:
Government Agencies: n/a
Notes: Mr. Morton examined the impact of the proposed development to the two relevant natural heritage features within the study area namely, the Provincial Significant Wetlands and the Locally Significant Wildlife Habitat. With respect to the Locally Significant Wildlife Habitat and the associated wildlife corridors, Mr. Morton concluded that there would be sufficient land base and coverage to maintain the corridor's ecological function.
Landscape Connectivity Policies and Legislation:
PPS 2005
Decision, Interpretation and Application of Landscape Connectivity Policies:

OMB File Number(s): PL050290
Decision Number: n/a **Issue Date:** December 14, 2007
Board Member(s): J de P. Seaborn and R.A. Beccarea
Landscape Connectivity Terms: "connectivity"
Overview: This case involves a series of appeals in connection with a proposal for a resort project for lands on Big Bay Point on the shores of Lake Simcoe.
Position of Parties: Prior to the hearing, Kimvar (the proponent) reached an agreement on how its development should proceed with the MMAH, **t**he County of Simcoe, the Town of Inisfil and two residents groups. The opponents (consisting of Nextnine Limited, 2025890 Ontario Inc. and the Inisfil District Association Inc.) participated in the settlement negotiations but did not sign the MOU and continued to oppose approval of the development.
Government Agencies: MMAH, Conservation Authority
Notes:
"Mr. Bowles, a field naturalist with expertise in the ecology of Simcoe County, was critical of Kimvar's assessment of the potential negative impacts of the development on species, natural features and ecological function of the site. Similarly, Mr. Craig testified that significant woodlots will be negatively affected and that interior forest habitat cover will be lost. Both expressed concerns about the Butternut and a loss of vegetation and the importance of connectivity."
"Mr. Craig suggested that the Board ought to be concerned about the extent to which forest cover and forest interior habitat is diminishing across the Town; yet the standards upon which Mr. Craig relied upon are not embodied in policy, but rather standards from a federal report examining planning for watersheds."

Landscape Connectivity Policies and Legislation: PPS 2005
Decision, Interpretation and Application of Landscape Connectivity Policies: The Board allowed all of the appeals in part. The Board concluded that the development is consistent with, and has regard for, the PPS and is supported by all levels of government including the Province, the County, the Town, and the local Conservation Authority.

OMB File Number(s): PL04118
Decision Number: n/a **Issue Date:** January 11, 2008
Board Member(s): S.B. Campbell
Landscape Connectivity Terms: "stream corridor", "linkages", east-west linkages", "Optional Linkage Preserve Areas", "connectivity", "linked natural heritage/open space system", "fragmentation", "natural connections",
Overview: "On June 2, 1998, Regional Official Plan Amendment No.8 ("ROPA 8") was approved by Council of the Regional Municipality of Halton (the "Region"). ROPA 8 (Exhibit #6a, TAB 1) sets out proposed expansions to the existing urban area of the Region to accommodate the projected residential and employment growth which could not be accommodated within existing urban areas. Included in this expanded area were lands in the Town of Oakville (the "Town") known as the "North Oakville Lands", that is, lands south of Highway 407, north of Dundas Street West, west of Ninth Line and east of Tremaine Road. It is intended that these lands will eventually accommodate 50,000 residents…"
The North Oakville Secondary Plan was the focus of long and intense negotiations between the municipality and private developers. The planning process included two separate subwatershed studies and two separate subwatershed plans, with the municipal planners and the developers each presenting a different Natural Heritage System for the suburban site.
"By August 14, 2007, after an extended period of successful mediation and negotiation, the Board was informed that a comprehensive settlement endorsed by Town Council and most of the (NOMI) landowners had been reached. During the course of this hearing further settlements were reached."
"Of the four issues remaining in dispute, one focuses on natural heritage issues and will be summarized here: the boundary of the Natural Heritage System with respect to lands owned by Capobianco and lands owned by Bazar. The lands which Capobianco argues should be excluded from the NHS are located in a Core Preserve Area, Core Area # 10, Buttonbush Swamp, as identified in the Subwatershed Study A portion of the Capobianco lands, including lands which the Capobiancos want removed from the NHS, form part of Unit 1 of the Candidate Oakville-Milton Wetlands and uplands Life Science Area of Natural and Scientific Interest (the "candidate ANSI")."

Position of Parties:
"It was the evidence of Mr. Speller, who is neither a hydrogeologist nor a water resources engineer that the Capobianco lands do not act as a source of water for the kettle wetlands on the adjacent lands."
"The evidence of Messrs. Speller and Cymbaly focused, the Board finds, on a comparison between the boundaries of the NHS in Core Area # 10 and in other cores. The witnesses alleged unfairness or inequitable treatment."
Mr. Bazar proffered no expert evidence to the Board. His focus in his testimony was on the lack of wildlife he sees on his land since Highway 407 was constructed. He does not want to be "penalized" with a NHS designation for having retained a woodlot on his property. He believes that too much land is being preserved in North Oakville. He believes that the Secondary Plan represents a "clever plan by the Town to acquire private land without compensation".

Government Agencies: MNR, Conservation Halton

Notes: The Board finds, based on a review of the evidence of the witnesses, the

direction of the policy documents and a review of the Subwatershed Study, that not only is a systems approach an appropriate approach to determining the boundaries of a NHS in a developing urban area, it is the best approach. It is clearly the best approach given what experts now understand about environmental biology. No longer can society afford to look at the "natural environment" as isolated pockets of green which have been fortunate enough to have survived in an urban landscape. The Board is convinced by the evidence adduced in this hearing, that for the natural environment to have a chance of sustainability in developing urban areas, a systems approach must be taken to delineating boundaries. The Board was particularly persuaded by the evidence of Dr. Stephenson and Dr. Tegler, that the use of a systems approach substantially increases sustainability of the natural environment in an urban context "by supporting the diversity of species and making the natural area more resilient to the effects of urbanization". This approach demonstrably facilitates the balancing act mandated by the PPS between the need for urbanization in the Province and the protection of the Province's natural heritage.

Landscape Connectivity Policies and Legislation: PPS 1997, NHRM

In Ms Howson's opinion, the objective of the PPS is to protect natural heritage features and adjacent lands from the negative impacts of incompatible development. Policy 2.3.3 speaks directly to "the diversity of natural features…and the natural connections between them", mandating maintenance and improvement, where possible.

In Ms Howson's opinion, the Secondary Plan has achieved the directions of the PPS; it has established a NHS comprised of core areas and linkages which are to be protected from the negative impacts of incompatible development. The Board accepts Ms Howson's opinion and finds that OPA 272 has appropriate regard for the policies set out in the PPS.

The Board must, in applying the policy documents correctly, consider both the potential impact of development on specific natural features and functions on the Capobianco lands and on adjacent lands. The systems approach to delineating the boundary of a natural heritage system, by definition includes what might otherwise be characterized as "only" adjacent lands. The evidence that this Board has heard and read in this hearing demonstrates that lands adjacent to specific natural features have a crucial role to play in ensuring the health and viability of the Province's natural heritage.

The PPS provides in section 2.3.1 "natural heritage features and areas will be protected from incompatible development". Section 2.3.3 provides "the diversity of natural features in an area, and the natural connections between them, should be maintained and improved where possible". Section 2.3.2 addresses "adjacent lands", providing "development and site alteration may be permitted on adjacent lands to a) and b) if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which the area is identified".

"Adjacent lands" is a defined term in the PPS: "adjacent lands means those lands, contiguous to a specific natural heritage feature or area, where it is likely that development or site alteration would have a negative impact on the features or area. The extent of the adjacent lands may be recommended by the Province or based on municipal approaches which achieve the same objectives" (emphasis added).

Dr. Tegler reviewed with the Board MNR's Natural Heritage Manual, which was prepared as "a guide for those who require additional information on technical issues relative to the application of section 2.3 – Natural Heritage of the PPS". "Adjacent

lands" are addressed at length in this document (Exhibit #6a, TAB 7). The manual reinforces the words of the PPS, making it clear that the municipality "may define adjacent lands using a variety of approaches depending on site-specific conditions. In all cases, these approaches should meet the overall objective of protecting significant woodlands (and wetlands) from incompatible development".

The Board finds that the Capobianco exclusion lands are "adjacent lands" for the purposes of the planning documents. Following the direction of the PPS, these lands may only be developed if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which the area is identified. Having reviewed the evidence of Messrs. Speller and Cymbaly, the Board finds that there would be no negative impacts attendant on the development of the exclusion lands. Rather, the Board finds that the Town and region witnesses compellingly demonstrated that the Capobianco lands, "adjacent lands", would have substantial negative impacts on the NHS in Core Area # 10 as they contribute to the provision of vital interior woodland habitat.

Decision, Interpretation and Application of Landscape Connectivity Policies: The appeals are dismissed.
Capobianco appeal is dismissed: "Having reviewed the evidence of all the witnesses, and the exhaustive work that was done in the Subwatershed Study, the Board accepts the evidence of Ms Howson that the land use designations on the Capobianco lands are appropriate and reflect good planning in delineating the boundaries of the NHS based on the Subwatershed Study. That study, after duly justifying the use of the systems approach to identifying the NHS, conclusively demonstrates the significance of the natural heritage features and functions on and adjacent to the Capobianco lands. The reasons for including the exclusion lands in the NHS are well documented; they are lands adjacent to significant woodlands and wetlands and any development on these lands would have a negative impact on the natural features and ecological functions for which the area is identified. When the Board hears evidence that it is dealing with lands containing, or vital to the survival of, provincially or globally rare species and habitats, it must proceed with utmost caution. In this case, the Capobiancos adduced no evidence which would persuade the Board to adjust the boundaries of the NHS in the vicinity of these species and habitats."

Bazar appeal is dismissed: "The Board applies the same reasoning to the Bazar lands that it applied to the Capobianco lands. The Town has demonstrated to the satisfaction of the Board that there are legitimate land use planning reasons for the designation of the Bazar lands. Mr. Bazar's wish to take advantage of the "development potential" of the lands does not outweigh the value of the lands to the preservation of the NHS in North Oakville."